THE

RAILWAY GAZETTE

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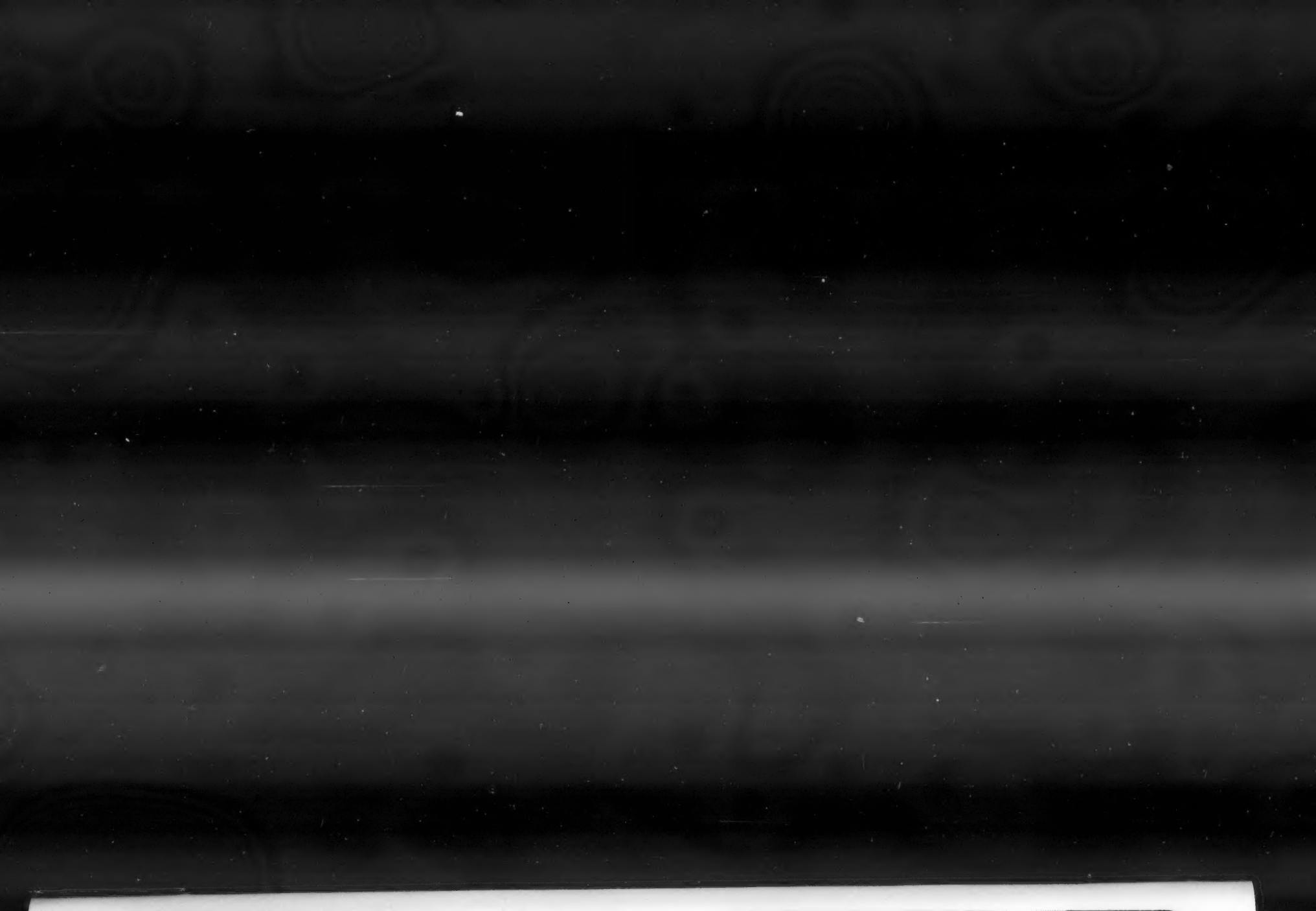

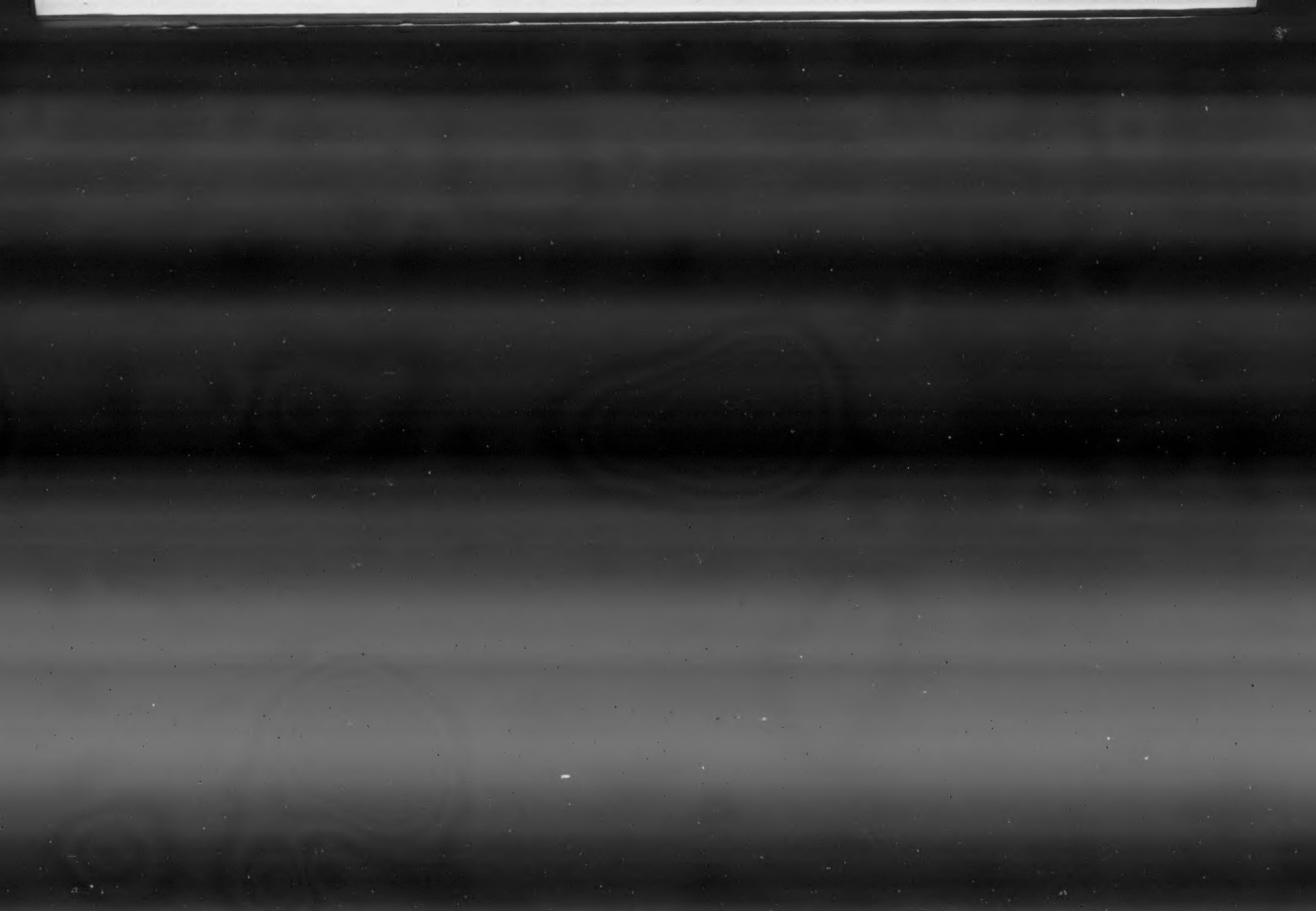

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Challenge to Railwaymen

IT is rare for a Minister to speak so plainly and sternly to an industry for which he bears responsibility as did Mr. Harold Watkinson, Minister of Transport & Civil Aviation, in the House of Commons last Tuesday. Speaking on the third reading of the Transport (Railway Finances) Bill, he declared that it must be understood that the decision to apportion the large sum of money required for the railway modernisation plan from the very scarce national resources was one which, regarded purely from reasons of popularity, might better have been in favour of roads or other things. "I want this great industry to realise that this plan is not a soft option for it," he declared. As Mr. Watkinson himself realises, the industry does not regard it as such. Indeed, it was the British Transport Commission which made it clear to the Minister that it did not want a subsidy and was confident of its ability to pay back the loans which it expects to receive. It is possible, however, that Mr. Watkinson's words—described by one newspaper as a "threat"—were not directed at the management, for he went on to state plainly that if the men in the railway industry did not want to work the plan, the plan was finished. In the end the railways would have to be "broken up, sold, and disposed of." It may be that Mr. Watkinson had one eye on the critics of the Bill, both inside and outside Parliament, when he spoke in these terms. The railway trade unions have shown themselves willing to join with the management in discussing productivity and Mr. Watkinson admits that the formation of the British Railways Productivity Council may yet prove to be one of the turning points in modern railway history. The indications indeed are that morale has much improved since publication of the plan, and that the great bulk of railwaymen are co-operating wholeheartedly in its implementation. His thinly-veiled warning on wage claims is timely, and the unions would do well to consider the link between increased productivity and higher wages before pressing for large basic increases at this crucial time. Meanwhile, British Railways passenger and parcels receipts rose in the first fortnight of the year by some 20 per cent compared with the same two weeks of 1956, and general merchandise traffic has risen by 10 per cent.

Mr. R. H. Hacker

NEARLY 130 representatives of railway, shipping and air travel and travel agencies, both at home and abroad, were present at the Dorchester Hotel, London, W.1, on Monday last at a luncheon given in honour of Mr. R. H. Hacker on his retirement. Major-General Gilbert S. Szlumper, a former General Manager of the Southern Railway, who presided, paid high tribute to Mr. Hacker's achievements in the promotion of traffic between this country and the Continent during his forty-seven years of railway service, which culminated in his appointment as Chief Officer (Continental), British Railways Central Staff, and from which he retired at the end of last year. Sir John Elliot, the present Chairman of the London Transport Executive, under whom Mr. Hacker also served while he was at Waterloo and also at the Railway Executive, emphasised the high reputation which Mr. Hacker has achieved on the Continent as well as at home. There can be no doubt that his outstanding position in Continental railway matters has been achieved by indefatigable work and an extraordinarily detailed knowledge of his subject allied to his personal charm. Mr. Maurice Vignon, Agent General, French National Tourist Office in London, who spoke on behalf of Continental travel interests, was equally warm in his praise of the outstandingly good work which marked Mr. Hacker's career.

Task for the Ministry

MR. HAROLD WATKINSON'S satisfaction, expressed in a speech to the Constitutional Club on January 17, at retaining his previous position as Minister of Transport & Civil Aviation will be shared by those who believe, as does Mr. Watkinson himself, that transport needs continuous study and application on the part of the Minister over a reasonable period of time. The task of his Ministry, he believes, is to give Britain the best and most modern transport system in the world. With the issue of supplementary fuel to road hauliers now in its final stages, the position as to transfer of freight traffic from road to rail may be expected to assume its final shape in the near future. Mr. Watkinson was able to assure his hearers that the railways are now carrying considerably more freight and passengers and that road vehicles are operating with higher loads. Nevertheless, the railways can still take more traffic and the British Transport Commission issued an appeal to traders last Monday, after the winter transport central joint conference in London, to review their transport arrangements and consider sending more goods by rail. British Railways are ready to put on special trains for any justifiably large flow of traffic.

Progress in British Railways Electrification

THE contracts let recently for electrical equipments for multiple-unit trains to operate on 50-cycle electrified lines of British Railways bring the realisation of the industrial-frequency scheme one stage nearer. Particulars of

the contracts, which, with others for circuit breakers, are valued at £8,000,000, were given in our Contracts and Tenders section last week. The test sections Colchester-Clacton and Slade Lane Junction (Manchester)-Wilmslow are due for completion next year and the complete Manchester-Crewe section should be finished by mid-1959. The circuit breakers for these sections are now on order, as are those for the multiple-unit trains to run on them. Four-car sets will run between Manchester and Crewe. Three-car sets will work the services from Liverpool Street to Chingford and Enfield Town which, with those on the Cambridge line as far as Bishop's Stortford and the Hertford East branch, are to be electrically worked by mid-1960. Electrical equipments are on order also for the Glasgow suburban scheme, the first stage of which, north of the Clyde, is to be completed by 1960. The largest order, for 112 sets of equipments, is for the four-car sets to be introduced in mid-1961 on the London, Tilbury & Southend line.

Features of the Equipment

THE 35 germanium rectifier equipments being supplied by British Thomson-Houston for the Manchester-Crewe trains represent the first bulk order placed by any transport authority in the world for germanium rectifiers for this purpose. The decision to use this equipment follows the successful trials of a 750-kW. unit fitted to a motor coach on the London Midland Region lines between Lancaster, Morecambe, and Heysham. These lines are electrified on the 6·6-kV. 50-cycle, single-phase a.c. system. The Glasgow area trains will be fitted with 91 sets of equipments being made by Metropolitan-Vickers. For the Liverpool Street scheme, General Electric is to equip 70 trains, the mechanical parts of which will be built in British Railways workshops. The three-car sets comprise a driving trailer, motor coach, and second driving trailer. The four axle-hung, nose-suspended, self-ventilated traction motors will have a one-hour rating of 200 h.p. and will operate on d.c. with a ripple component. Rectification will be by a group of single-anode rectifiers with liquid cooling by forced circulation. The 112 sets of equipment for the L.T.S. line will be supplied by English Electric. The 250 circuit breakers ordered from British Brown-Boveri are of particular interest as they are for electric locomotives as well as multiple-unit sets.

Increased Freight Rates in the U.S.A.

SUFFICIENT information is not yet available from the U.S.A. from which to assess accurately the results to be expected from recent decisions by the Interstate Commerce Commission. The position that arose in December was exceptionally complex, in that the Eastern and the Western railways had applied for a 15 per cent increase in freight charges and, unusually, the Southern lines had held back from this. Later, railways in all Districts had asked the I.C.C. for an emergency increase of 7 per cent. The Commission regarded the 7 per cent as coming within the 15 per cent application, but the railways maintained that it was additional. On December 17 the Commission authorised an emergency rate increase of 7 per cent for the Eastern and 5 per cent for the Western lines, that authorised for inter-territorial movements to and from the South being limited to 5 per cent. There were the customary exceptions and what are termed "hold-downs," or absolute amounts of increase; these usually apply to coal and kindred traffics. The I.C.C. is still considering the application of the Southern railways for a 7 per cent emergency increase and the 15 per cent request by the Eastern and Western lines, which they claim is needed for an enhanced return on capital investment.

Machine Tool Orders

THE production capacity of the machine tool industry in Britain now exceeds the rate of new orders by a considerable margin. This is largely because of the decline in the rate of orders from home customers, which, in September last, were the lowest for many months at £4,360,000, less by more than £1,000,000 than in the same month of 1955. In 1956, home orders dropped from a monthly average of £6,540,000 for the first quarter to £5,340,000 in the second, and £4,810,000 in the third. Export orders fluctuated from £1,970,000 down to £1,740,000 and up again to £1,950,000 in the same periods. The total effect has been a steady decline. Total deliveries rose in the third quarter to a monthly average of £7,080,000 with £7,480,000 in September, and final figures for the year may well show that the output for the industry as a whole has risen by some 10 per cent compared with 1955. The order book stood at £102,900,000 at the end of September, only slightly less than in the previous two quarters, but there is still some concern that orders, particularly from the motor industry, may be cancelled if the economic situation does not improve.

A Useful Film About Rail Lubrication

THE standard of technical and industrial films today is high; but the 16-mm. film "Carefree Curves," featuring rail lubrication and presented by the P. & M. Co. (England) Ltd. in association with Caltex, is one of the best we have seen. In briefly and clearly explaining the effects of curve wear on rails and showing how this can be reduced by rail lubricators, and their wide range of application on running lines and in yards in many countries and in all climates, the film is skilfully adapted to a great variety of audiences, from gangers to general managers; it will probably remind a good many senior civil engineer officers of points they have forgotten. A brief description is given on another page. The subject of rail lubrication is one of exceptional topical interest in view of the large-scale adoption in Britain and many other countries of electric or diesel-electric traction, and of the consequent increased amount of curve wear by multiple-unit trains and by locomotives. The film was shown in London last Friday at a cocktail party given by the P. & M. Co. (England) Ltd. at the Savoy Hotel, attended by representatives of British Railways, London Transport, and several systems overseas.

Air Pollution

FROM the paper presented to the Institute of Fuel recently by Dr. R. S. Scorer it is clear that the much maligned steam locomotive may not be as guilty of polluting the atmosphere of this country as many people would like to believe. Five independent factors, which determine how damaging the pollution will be, have been estimated for seven main classes of fuel consumers, which include industry, domestic, railways, and road traffic. The total damage to this country is estimated at £250 million a year, and the author of the paper, having considered the varying factors involved, is of the opinion that although railways cause £10 million worth of damage annually, road traffic is responsible for £16 million worth, while domestic fires cause damage of up to £210 million a year. A significant comparison is made of the approximate cost of damage per ton of fuel consumed for the above three classes, which is £0·7, £1·6, and £6 respectively. Dr. Scorer concludes that the greatest saving to the nation, of between £100 and £140 million a year, would be made by the universal use of smokeless fuel in domestic grates, and he suggests that some people may, through prejudice, be outraged by the assertions he makes. It may well be that, in this connection, the locomotive has been the subject of far from unbiased criticism.

Budd Lightweight Coaches

IN our issue of December 14 we commented on the progress being made in the U.S.A. in designs for lightweight passenger rolling stock. Among these was the "Pioneer III" type designed by the Budd Company for suburban work. Although this type of coach was designed in the first instance for suburban service, adaptations of the design have now been prepared for main-line use. These would range in weight from 27¼ tons

for a reclining chair coach to 32 tons for a dining car and 35¼ tons for a sleeping car, all very far below the minimum weights of even the most recent standard 85-ft. stainless steel cars. A remarkable feature of this design is the bogie, in which equaliser beams and springs, sliding journal boxes, spring hangers, spring planks and transoms are all eliminated, the principal parts being merely the side frames, a bogie bolster and two air springs. Each bogie complete weighs just under 3 tons instead of the normal 8½ tons. High tensile stainless steel is used throughout in the construction.

Welwyn Garden City Accident

ALTHOUGH the official report on the accident just south of Welwyn Garden City on January 7, which is being inquired into by the Chief Inspecting Officer of Railways, Lt.-Colonel G. R. S. Wilson, must be awaited before any complete comment on the case can be made, enough information has been allowed to be made public to make it clear that no error in block working was involved and that the colliding train overran several signals, even exploding emergency detonators without effect. All distant signals on up and down main lines between London and Grantham are now equipped with the track magnets for the British Transport Commission standard A.T.C. system recently approved in its final form; but the locomotive concerned had not yet been fitted with the necessary receiving apparatus, although equipment is proceeding as quickly as possible. Fortunately casualties were not heavy, though serious derailment followed the collision. The previous accident at this place on June 15, 1935, was attended with 14 fatalities and arose from a mistake in operating the block telegraph.

Railways in the Saar

THE change in the political status of the Saarland, as a consequence of the agreement reached between the German Federal Republic and France, has resulted, as reported in our issue of January 11, in the railways becoming part of the Federal system as from January 1. As, however, the Saar is to remain for currency and customs purposes united to France for another three years, a separate divisional management of the German Federal Railway is being maintained at Saarbrücken, which eventually will absorb the present one at Trier, set up after the war when the territory once again became separated from Germany. The Saar territory is about 1,000 sq. miles in area, almost the same as Luxembourg, with a million inhabitants, against 300,000 in the Grand Duchy, and an economy based on the rich coal deposits. The route-mileage of railways is about 330. Traffic is very heavy; about 75 per cent of it is freight, largely coal. The lines employ about 13,600 persons and have 112 stations, with some halts and 185 private siding connections. Plans for electrification are ready to be put into operation.

Signalling on the Saar Railways

THE signalling on the railways in the Saar territory is, as are the traffic operating methods, of German type, much of the original mechanical signalling equipment having come from the once well-known Bruchsal works. Renewal of damaged installations after the war was exceptionally difficult and the necessity of using French type rails and point layouts, from scarcity of standard German materials, occasioned some difficulties. Several mechanical installations were replaced by electrical, using power lever frames of conventional form; but more recently, some push-button panel signalboxes with route setting facility have been brought into service, including a large one at Dillingen, where four lines converge; this is constructed on the "geographical circuiting" principle, recently introduced and attracting considerable attention in Central Europe. The new box has replaced four mechanical ones installed 60 years ago and controls 140 sets of points and 81 signals. Besides the main station, used by some 150 trains daily, it controls the adjoining marshalling yard.

Diesel Locomotive Building and Servicing

THE Derby Locomotive Works of the London Midland Region, and formerly of the L.M.S.R., has been engaged in large-scale construction of diesel locomotives for many years, and since the war diesel-electric shunting engines have formed a major part of each year's locomotive building programme; the 1957 programme includes the construction of 82 diesel-electric shunting engines with power equipment supplied by the English Electric Co. Ltd. In a paper delivered before the Institution of Locomotive Engineers last Wednesday, Mr. T. F. B. Simpson, Works Manager of Derby Locomotive Works, stated that up to the end of 1956 a total of 331 diesel-engined locomotives had been built.

Referring to the pioneer work which had been carried out in this country, he observes that in 1928 an experimental diesel-powered train which operated on the L.M.S.R. in the Blackpool area, on the former Lancashire & Yorkshire Railway, was a forerunner of what is today the multiple-unit railcar. A 500-h.p. Beardmore engine with English Electric generator and equipment, he recalls, were installed in an experimental four-coach train and ran fairly successfully for some time, during which valuable experience and knowledge was gained, which was ultimately used in the development of the high-speed diesel engine commercially manufactured today. In 1931 the L.M.S.R. converted from steam to diesel, a 0-6-0 shunting locomotive with a 400-h.p. Paxman engine and hydraulic transmission, and while results with these two units were not so spectacular as originally visualised, they can be regarded as the background to the large number of diesel shunting locomotives, not only in this country, but in the British Commonwealth overseas and in many other parts of the world; among the diesel locomotives built at Derby are the two main-line units Nos. 10000 and 10001, and the Fell diesel-mechanical locomotive No. 10100.

Referring to the 1957 diesel locomotive programme during which 82 engines would be built, Mr. Simpson states that construction will follow the well-established practices of steam locomotive construction, and will consist of 21 stages, each well defined. The total time allowed through the erection stages is 34 days; to achieve the requisite output within the year requires the laying down of a frame on a separate berth every three days. It will be appreciated, he emphasises, that this calls for just as careful planning by the contractor for delivery of the power equipment, as is applied to components made in the works, in view of the congestion that could easily arise. On completion locomotives are subjected to a test to ensure not only that the main engine will develop its full rated output, and that the generator will convert this correctly, but also that the engine/generator characteristics are correct to the full range of settings of the control equipment. Tests also check functionally all auxiliary machines, equipment, and circuits, and enables a most comprehensive and careful adjustment to be made under what are virtually, service conditions.

A more comprehensive test house designed to deal with all types of diesel-electric locomotives at present envisaged, is under construction, which it is hoped to place in operation towards the end of this year. For various reasons it has been decided that metal grid resistors are to form the basis for any new equipment. The design therefore incorporated naturally-ventilated banks of resistors, with control by means of electro-magnetic or electro-pneumatic contactors. The resistors are centre tapped and can be progressively connected in series-parallel combinations to give the requisite steps of resistance, and vernier control is embodied, which enables a fine control to be obtained between the normal running notches. An unique feature has been introduced to make the control of the test easy for the inspector who is now housed remotely from the locomotive; this is a high volume three-way intercommunication system between the control desk, the cab, and the engine room of the locomotive, the amplifier for the equipment being mounted in the control desk.

The 100-V. d.c. supply for the control of the electro-

magnetic contactors is provided by means of an external rectifier, while the electro-pneumatic contactors will be fed from the works air network. The test house will be a two-storey building, the resistors and contactors will be housed on the first floor with special provision for ventilation. Two control rooms will be provided on either side of the building external to the actual testing area, but provided with small bay windows opening on to the test area, respectively controlling the separate 400-h.p. and 2,300-h.p. resistors. All power connections between resistor/contactors and control rooms will be by aluminium busbars, carried on high-tension insulators, the voltage between poles being up to 600 V. in the case of shunting locomotives, and 1,000 V. in the case of main-line engines. Power, control and intercommunication cables will be carried on swivelling wall-mounted cantilevers.

Cables, some of which will be of heavy cross-section—up to 2,000 amp. intermittent load has to be catered for—will be permanently installed, the cantilever being swung over the cab position for the cables to be connected at the cab controller terminal bars of the locomotive under test. Electro-magnetic control of contactors will be retained for the 400-h.p. equipment, but the electro-pneumatic control will be used for 2,300-h.p. resistors. Availability of spares is ensured, as contactors will be of the standard type as used on locomotives. Mr. Simpson also deals with the problem of repairs to diesel shunting engines which are given a general repair at intervals of approximately 80 months, equivalent to some 60,000 miles, with one intermediate repair at 30,000 miles. The periodicity of repair to main-line diesel locomotives is not yet so clear, but he suggests it may be taken at 300,000 miles with one intermediate repair. High availability is a feature of diesel traction, and a standard examination routine at motive power depots should ensure continuous operation without undue mechanical or electrical failure.

Western Australian Railways in 1955-56

OPERATING performance reached new levels in the year ended June 30, 1956, as shown in the report of the Western Australian Government Railways Commission, of which details have been communicated to us by Mr. A. G. Hall, Commissioner of Railways. The tonnage of goods and livestock increased by 11 per cent to 3,792,856, and the ton-mileage increased by 9 per cent to 608,418,205. At the beginning of the year traffic prospects were obscure, because of the uncertainty of the wheat market, but haulage of wheat was better than expected.

Earnings rose by £743,756 to £13,274,166, an increase of nearly 6 per cent but operating expenses increased from £14,925,985 to £16,123,763, an increase of 8 per cent. Including interest, and an amount of £42,933 for rehabilitation of fully depreciated assets, the deficiency for the year was £4,615,844 compared with £3,809,522 in the previous year.

The process of replacing steam locomotives with diesel-electric locomotives in certain areas was advanced, and will be continued in the ensuing year. The order for 48 "X" class Metrovick main-line diesel-electric locomotives was completed in August, 1956.

Comparative figures for the last two years were:—

	1955-56	1954-55
	£	£
Earnings	13,274,166	12,530,410
Operating expenses	14,993,054	13,935,329
Depreciation	1,130,709	990,656
Interest	1,723,314	1,413,947

The capital investment at June 30, 1956, was £43,262,258, an increase for the year of £2,871,106. Large items of capital expenditure during the year were:—

	£
Locomotives, coaches, and wagons	1,125,701
Permanent way renewals and improvements	1,929,425
Mechanical and motive power workshops machinery and improvements	351,297
Housing for staff	253,506
Communications, interlocking, etc.	168,827
Industrial requirements and amenities	105,403

Since July, 1950, when railway capital was written down by £12,326,349 to £17,844,634, the net increase, excluding stores funds, has been £25,417,624. However, rising costs have reduced the advantages which might be expected from this large figure, and the restoration of the railway to a state of full efficiency is still far from complete. The percentage of operating expenses to earnings was 112·95.

Train miles run amounted to 8,278,200, an increase of 508,974. Road bus miles were 1,505,382, a decrease of 139,592. On the passenger side there was a substantial increase in diesel rail car mileage, particularly in the suburban area, while increased haulage of grain, particularly wheat, accounted largely for the greater goods train mileage. Road bus mileage has been reduced as passenger rail services improved. Earnings per train mile, with the preceding year in parentheses, were 371·91d. (372·51d.) and operating expenses 421·7d. (415·99d.)

Passenger-journeys totalled 12,582,979, an increase of 2,092,430. There were increases in both country and suburban passenger journeys, the suburban lift being by far the greater. The timetable introduced on November 28, 1954, in which the running times were reduced and the new diesel-mechanical rail cars took over most of the services, has proved very popular with the travelling public. Paying-ton mileage was again a record, with 608,418,205, an increase of 51,913,439 over last year's record. The major increases were in such bulk traffics as timber, wheat, other grain, and ores and minerals.

The average distance traffic was hauled was 160·41 miles (163·36 miles in the previous year), total earnings for goods traffic £10,791,184 (£10,174,279), and the earnings per ton mile 4·26d. (4·39d.)

Principal traffics hauled were coal, coke, shale, and charcoal—13 per cent of total ton mileage, timber—10·14 per cent, wheat—22·05 per cent, ores and minerals—10·27 per cent, fertilisers—8·08 per cent, and general goods (A, B, C, first and second classes)—12·24 per cent.

The average mileage of line worked was 4,119, an increase of eight miles, caused by construction of a new line to serve the Kwinana area. The average staff employed during the year was 13,856, an increase of 302. The pattern of staff recruitment underwent some change during the year. At the commencement the Department was faced with a labour shortage which, although not as acute as it had been, covered a wide range of positions. At the end of the year the only vacancies were for trainee enginemen, juniors, boilermakers, blacksmiths, and electrical fitters. The mean population of the State rose to 699,000, equal to 162 per mile of railway open.

Work Study in Engineering Maintenance

DEVELOPMENT in the United Kingdom of work study to ensure rational labour control and incentives has been remarkably rapid during the last few years, but it was not at first considered suitable for application to railway civil engineering maintenance due to the complexities of that work. Though it had been introduced at the Southern Railway pre-cast concrete depot at Exmouth Junction in 1947, the first investigation into its possible suitability for general maintenance on engineering districts was not undertaken by the Railway Executive until 1951. With the advice of and training by industrial consultants, members of the technical staffs of regions became conversant with its techniques, enabling pilot schemes to be inaugurated in 1955. During the following year the scheme for permanent-way length-gang maintenance was applied to eight inspectors' sections, and also to steelwork fabrication in the civil engineering workshops, to bridge and station repairs and to painting on the Southern Region.

This information as well as a description of the actual techniques now in practice are contained in a paper entitled "Work Study and its Application to Railway Civil Engineering Maintenance" presented by Messrs. P. D. T. Pescod and J. C. F. Cameron to the Institution of Civil Engineers on January 10. The paper defines work study as "the critical and analytical study of all forms of human labour, made with a view to obtaining the best use of

man-power in particular and increased productive efficiency in general." The advantages to both management and staff of work-study techniques include reduced costs, better-quality work, more consistent work loading, higher pay, shorter hours and better management and working conditions. The greatest advantage, however, is that a new spirit of progress, sense of purpose, confidence in other men and satisfaction in work is generated.

The authors go on to describe its techniques in detail and the bases it provides for just incentive schemes of payment by results. The merits and disadvantages of track maintenance by mechanised and mobile gangs as opposed to the older length-gang system are also discussed. The former, though appearing as the more economical to the work-study specialist, is not considered practicable on the dense-traffic districts of the Southern Region. The work study techniques were therefore applied to the older system to supplement the organisation of the Section Inspector, with the aid of some additional supervision under him. Among other matters dealt with are allowances for train interruptions, the best methods for introducing the scheme and the explaining of its details to the gangmen and staff generally, the gradual improvement in the productive efficiency of typical sections working under heavy-traffic conditions, and the application of it to structural maintenance work.

In conclusion they stress the need for the most efficient methods of maintenance and renewal on British Railways to provide a service essential to the trade of the country. The modernisation works scheduled can be met in part by expansion of the labour-control scheme to sections where there is little shortage of manpower on day-work establishments, and to workshops fabricating materials for the maintenance programme. Finally, they express the view that for the success of all these schemes, it is essential for the supervisory grades to share in the financial benefits accruing, on the basis of payment proportional to the efficiency with which supervisory duties are carried out.

Improvisation in Pakistan

A GOOD deal is heard about the progress and development of Indian railways since Partition, but comparatively little about those in Pakistan. They too had serious difficulties to contend with, not the least being in connection with the permanent way. In 1947, the North Western Railway lost to India three of its largest track depots at Ghaziabad, Saharanpur, and Dhilwan, as well as the sleeper-treating plant at the latter place. Moreover, previous sources of supply of steelwork were almost all in India, such as Tatas, Burns, Richardson & Crudas, and Braithwaites. Even wooden sleepers came mainly from the United Provinces, Jammu (Kashmir), and the Simla Hills, none of them in Pakistan. Consequently, track renewals fell in 1948 to about 10 per cent of what were considered essential before the last war.

This serious position was met initially by increased reconditioning of materials of all kinds, and the refabrication of many others that were obsolete, in various railway workshops, a policy that has increased rapidly since then. Additionally, it subsequently proved possible to import some material, such as 1,200,000 steel sleepers from the U.K. and France during the period 1950-55, and 600,000 Douglas fir sleepers from Canada under the Colombo Plan. Fruitless efforts to obtain sleeper creosoting plant from abroad at a reasonable price, induced the N.W.R. administration to manufacture this plant in its Bridge workshops and Jhelum, for subsequent erection near Wazirabad. So successful was this, that a second plant is being or has been turned out at Jhelum for the Eastern Bengal Railway in Eastern Pakistan.

Moreover, metal sleepers of the cast flat-plate and tie-bar pattern are being turned out in rapidly-increasing numbers from the Signal Shops at Lahore; 100,000 a year are expected to be available shortly. The Steel & General Mills of the Mechanical Workshops at Moghalpura (Lahore) are also mass-producing from scrap track fittings, such as the loose-jaws of metal sleepers and standard two-way keys, of which over 5,000,000 had been turned out as long as two years ago. A new heavy type of fishplate is also being produced in large quantities, and flats and round bars are being rolled for tie-bars, cotters, spikes, fishbolts, and other fittings. Railway shops are also reconditioning points and crossings by electric welding, and in addition some 500 crossings have been resurfaced by oxy-acetylene welding in the track by mobile gangs during the last three years.

In this way the N.W.R. has not only become largely self-supporting in so far as permanent way is concerned, but it has also been able to make valuable contributions to the Eastern Bengal system. Another important aspect of this self-sufficient policy is the considerable reduction in foreign exchange required by Pakistan, estimated already to exceed £150,000 annually and steadily increasing. Such savings on one branch of permanent way maintenance alone is in keeping with the economic policy of introducing diesel traction on a large scale.

Classification of U.S.A. Railroads

EFFECTIVE January 1, 1956, the U.S.A. Interstate Commerce Commission revised the classification for Class 1 railroads to include carriers with annual operating revenues of $3 million or more. The Association of American Railroads has explained that the change removed 13 railroads from the Class 1 category, but added five which qualified for admission. Particulars of these railways and the mileage they operate are given below. The effect of the change was to curtail total U.S.A. Class 1 mileage by about 1,000 miles and to reduce aggregate operating revenues by less than one-tenth of one per cent. The monthly statement of Class 1 Railway Revenues and Expenses in 1956 gives comparative data for 1955 revised to accord with the new classification.

The Car Service Division, A.A.R., has stated that the new rule for classifying railroads decreased by 10 the number of locomotive units owned by Class 1 railways. Its monthly reports show that on January 1, 1956, Class 1 railways owned 24,924 diesel units and increased their stock to 26,006 units by November 1, when they still had 719 new units on order. On November 1, only 912 diesels, or 3·5 per cent of the stock, were under repair. The low percentage in bad order left 25,094 serviceable diesel units, against 3,350 steam locomotives and 554 electric units. Diesels thus constituted 86·5 per cent of the 28,998 locomotive units available for moving traffic on Class 1 railroads.

These facts show clearly that the changes in the list of Class 1 railroads did not influence the extension of diesel motive power and cannot have modified appreciably the 1956 operating results which will be announced in April.

RAILWAYS REMOVED FROM CLASS 1

Region	Railway	Mileage operated	Number of diesels used in 1955
N.E.	C.N. lines in N.E.	172	3
	C.P. lines in Vermont	90	20
Great Lakes	Cambria & Indiana	35	8
	Detroit & Mackinac	232	7
	Montour	51	10
	Pittsburg & Shawmut	97	9
Pocahontas	Atlantic & Danville	205	7
Southern	Columbus & Greenville	168	8
	Mississippi Central	148	7
Central Western	Utah	99	6
South Western	Texas & Northern	8	2
	Midland Valley	334	7
	Oklahoma City–Ada–Atoka	132	2
	Total	1,771	96

With the exception of the Canadian lines in New England, these railways are freight roads.

RAILWAYS ADVANCED TO CLASS 1

Region	Railway	Mileage operated
Central Eastern	Litchfield & Madison	44
Southern	Carolina and Northwestern	284
	Piedmont & Northern	128
	Savannah and Atlanta	144
Northwestern	Minneapolis, Northfield and Southern	77
	Total	677

Past and Future of Power Signalling

THERE are many who can always find enjoyment in listening to a paper tracing the evolution of ideas in their professional field and the ways in which they have influenced the design of equipment, rendering it, in its various forms, continuously better adapted to the ends to be served, themselves in turn affected by the passage of time. The paper by Mr. O. S. Nock on the past and future of power interlocking apparatus, read recently before the Institution of Railway Signal Engineers, was of considerable value in tracing the development of power signalling techniques and equipment.

The first practical power systems, the hydraulic, hydro-pneumatic and pneumatic, came from the wish to have something robust and comparatively simple which could be kept in order by men trained to maintain ordinary mechanical signalling apparatus. The use of electricity on railways then was confined practically to the telegraphs and eventually some telephones, with a few devices affording a means of communication in some form, as seen in signal repeaters and similar indicating instruments, electric bells, and some early installations of electric light; but these things were not in the care of the signal department. For some time batteries had to be depended on for a supply of current. Even when this was no longer always the case, wires and cables were not at first of the quality essential to complete electric power working. Purely mechanical systems were free from troubles arising from false contacts, electrical leaks and short circuits and appealed strongly to some engineers, inclined to distrust electrical devices. Many installations of them were made and continued to give good service over long periods, in some cases down to the present day. Track circuiting was indeed known before any of them were in existence, applied first in connection with automatic signals, some simple forms of which workable from primary batteries, such as Hall's discs, had been produced.

Inventors in the electrical field persevered in their endeavours to construct equipment able to rival the hydraulic and pneumatic types but met greater difficulties than the originators of the latter had encountered. A combination, however, of pneumatic operation with electrical control by small currents at low voltage proved successful and finally, after some applications of solenoids—which did not prove satisfactory for operating points, although in use even today for signals—electric motor mechanisms, with the necessary controlling and detecting devices were produced and brought in the course of time to a high state of efficiency. It then became clear that the hydraulic and all-pneumatic systems would cease to be resorted to for new work, while the increasing use of track circuiting and the semi-automatic control of signals in signalbox areas tended to break down the old departmental barriers and obliged the signal engineer to be as much an electrical as a mechanical man.

For some time, however, as Mr. Nock pointed out, practically all that was done was to substitute power for muscular effort. Official restrictions, only gradually relaxed, still limited the distance at which points might be worked and hence the possibility of using fewer signalboxes. Power working progressed much more slowly on main lines in the United Kingdom than its advocates had anticipated, although on two or three railways an appreciable amount of work was done in the first decade of this century. On others, beyond an initial installation or two, little or no progress was made, but it is known that some would have gone much further but for the 1914 war. The London underground lines were, of course, in a class apart, power and automatic signalling being practically essential to the success of the change to electric working. With the end of the war prospects improved and the post-grouping years witnessed an increasing appreciation of the benefits to be obtained from applying power working, track circuiting and train describing apparatus, where the elimination of numerous mechanical signalboxes offered the chance of effecting great economies, not to mention that traffic conditions on electrified lines could no longer be met, at least in certain areas, by older methods. Although the lever frame continued to be used at first many detailed improvements were introduced and the use of colour-light signals reduced the amount of mechanism required out of doors. At length the idea, fruitlessly discussed many decades before, of obtaining interlocking action purely by circuiting was revived effectively and put into practice successfully in combination with route-setting, itself in use for many years in France. This course eventually was followed in other countries and, combined with improved manufacturing processes, is reflected now in numerous installations. Mr. Nock referred to all these things and to other trends, such as the application of coded remote and centralised controls for which he sees, correctly as we think, an encouraging future.

Letters to the Editor

(*The Editor is not responsible for opinions of correspondents*)

Named Expresses

January 21

SIR,—The laudable idea of giving names to express trains has been grossly and unimaginatively overdone by British Railways. Surely it is pointless to attach a fancy name to a train unless it is composed of specially built and specially painted vehicles. At the present time the only British named expresses composed of special vehicles with a distinctive carriage livery, are the various all-Pullman "limiteds," and the "Night Ferry"; the latter being composed of Wagons-Lits Company sleeping cars.

Of our other named expresses, a growing number of those running in the Western Region have a special carriage livery, which is virtually that of the old G.W.R.; but they are not composed of special stock, such as air-conditioned vehicles, coaches with retiring rooms, bar cars, lounge, observation or sleeping cars. Some named trains are not composed of special vehicles, nor have they a special carriage livery; amongst these, I regret to say, is the "Royal Scot."

Yours faithfully,

RICHARD B. JONES

29, Hyde Park Gate, S.W.7

Rough Riding in Passenger Stock

January 16

SIR,—It is high time that British Railways took effective action to remedy the bad riding of some of their crack trains. A recent journey to Glasgow by the "Royal Scot" reminded me of this serious defect. For long periods the coaches are subject to violent shuddering, principally of a lateral character, with some indication that the wheel flanges are making repeated and violent impact with the rail heads. The result is a journey which is trying in the extreme. If the French National Railways "Mistral" can glide—I emphasise, glide—at 80 m.p.h., surely our bogie designers and permanent way engineers can provide reasonable riding at about 60 m.p.h.? Railway engineers must know of the problem and presumably have examined it and also know the answer. Why, then, is no action taken?

Nor is the problem new. I can remember a journey from Glasgow to London over the Midland track, before the war, i.e., 20 years ago, when this lateral shudder was so pronounced that I had to move from an end compartment to a centre one to be able to read the print of my book.

Yours faithfully,

T. E. GREEN, M.I.MECH.E.

6A, Blackheath Park, S.E.3

[British Railways are aware of this complaint and a technical investigation is in progress.—ED., *R.G.*]

THE SCRAP HEAP

Pessimist

Driver on the Lubeck-Stawell run, approaching the Glenorchy bridge at 60 m.p.h. during flood time, started rolling up his trousers. His timid fireman, asking why, was told: "Don't you know? Glenorchy bridge's washed away!"—*From the "Victorian Railways News Letter."*

Lifetime of Lifting

Life was full of ups and downs for 50 years for Mr. A. Pike, who retired recently after a lifetime of service as lift operator with two railway companies. In 1906 he helped to build the offices of the Grand Trunk Railway at 17/19, Cockspur Street, S.W.1, and on completion of the building was employed by the G.T.R. as a messenger. His uniform then was similar to that of a theatre call-boy, with rows of tiny buttons and a black bowler, to complete the picture of a well-dressed messenger of the early 1900s. When one of the first Waygood automatic lifts in London was installed, he combined the jobs of lift operator and messenger. He well remembers the *Titanic* disaster in 1912, when the passengers office was crowded with people desperately trying to trace survivors, whilst across the road at the White Star Line building queues formed for information.

After serving in the 1914-18 war, Mr. Pike rejoined the company, which had now become part of Canadian National Railways; he was transferred to the new office in Southampton, where he served until the slump of the 1930s caused the office to close. While at Southampton, he handled goods for shipment to Canada. One of the express shipments was a dog, the mother of the famous Rin Tin Tin; she created a problem by giving birth to three puppies just before the ship sailed, so that the owner had to pay for four dogs' passages. Since returning to London he has seen service under five European Managers. He has served two railway companies well, without the loss of a single day's work, for he has never been absent for illness throughout the whole of his career.

"City of Truro" to Run Again

The G.W.R. 4-4-0 locomotive *City of Truro*, which made railway history on May 9, 1904, by achieving the highest speed recorded up to that time, of 102·3 m.p.h. between Plymouth and Bristol on a journey to Paddington, after a quarter of a century of retirement, is to leave the seclusion of the York Railway Museum and return on indefinite loan to the scenes of its exploits, now the Western Region of British Railways. There it is planned to use the engine to haul excursion trains which are chartered from time to time by clubs and societies of railway enthusiasts.

Roaring Time

In the early years of this century the Indian stationmaster at Simba, a station on the line between Mombasa and Nairobi, applied to railway headquarters in Nairobi for an askari to give him protection from the lions which frequently visited the platform. His request was granted and the man was sent down.

Reporting his arrival, the stationmaster wired, "Askari arrived, very brave man." However, the following day a further telegram was received as follows: "Askari not so brave at roaring time, please arrange." These documents were kept in the railway archives for some years, and may still be preserved.—*From a letter to "The Times."*

Railways on North Borneo Stamps

We are indebted to Mr. Chin Piang Kong, Chief Clerk of the North Borneo Railways, for the stamps depicted in the

accompanying illustration. The (red) 10-cent stamp giving the date of the opening of the railway, was issued in November, 1956, to commemorate the 75th anniversary of the North Borneo Chartered Company. The colour of the 3-cent stamp is green.

Jam Tomorrow

The Minister of Transport, in
A statement to the nation,
Quite recently gave utterance to
Some welcome information.
He spoke of *inter alia*
A Year of Jubilee,
When British Transport will at last
From daunting debt be free.
He made his statement brave and bold,
He made it loud and clear,
He even emphasised the date
And specified the year.

So, look ahead, my lucky lads,
Things won't be always blue;
Sing "Glory, Hallelujah!", then,
For 1962,
When, by some honest toil and sweat
And much modernisation,
We shall be able to present
A clean bill to the nation.
Let bygones then be bygones,
Let past disputes be dead
And celebrate our long-deferred
Emergence from the red,
For none will dare to denigrate
Or say we are effete,
When 1962 comes round
And we make both ends meet!

A. B.

Railway Motif for a London Tavern

The redecorated saloon bar of the Railway Tavern, Liverpool Street, London (*see page* 538 *of our November* 2, 1956, *issue*)

OVERSEAS RAILWAY AFFAIRS

(From our correspondents)

SOUTH AFRICA

Heavy Lorries for Engineering Work

Mr. B. J. Schoeman, the Minister of Transport, in a recent address to the annual conference of the Natal Chamber of Industries, announced that the doubling of the main line between Durban and Johannesburg has been placed on the South African Railways priority list in an effort to cope with all foreseeable traffic demands. The work is expected to cost £12,500,000. Delivery of Leyland Hippo six-wheel heavy-duty trucks for use on this work has already commenced, nine of these vehicles having been delivered to the S.A.R. Civil Engineering Department with a further nine to follow shortly. This department already has more than 100 Leyland vehicles in service.

EAST AFRICA

Deep-Water Berths at Kipevu

A contract let recently by E.A.R. & H. for the construction of four wharf walls and reclamation for new deep-water berths on the Mombasa mainland at Kipevu is valued at £1,900,000. The wharf walls, each some 600 ft. in length, have been designed to accommodate ocean-going ships and will provide a minimum depth of water of 33 ft. at low water ordinary spring tides. To achieve this it will be necessary to dredge more than 200,000 cu. yd. of mud and silt from the sea bed. The walls will be constructed of reinforced concrete piles. The decking will be of reinforced concrete and is designed to carry the cranes and railway tracks.

The reclamation work consists of moving some 530,000 cu. yd. of earth, which will be placed behind the stone bank at the back of the wharves to provide a levelled area for the accommodation of sheds, roads, railways, and stacking grounds, which will be built as port requirements necessitate.

RHODESIA

Traffic Figures

Traffic figures on the Rhodesia Railways continue on an upward trend. The figures for September, 1956, show the following increases over the corresponding month of 1955. General goods, from 275,371 tons to 396,389 tons; coal and coke, from 276,195 tons to 305,916 tons. The grand total for the month of September (including livestock) was 853,851 tons in 1955 as against 894,047 tons in 1956, and the total number of passengers carried rose from 306,660 to 321,104.

Road Motor Services

August was a record month for the road motor services according to figures recently made available. For the first time in their history, the monthly vehicle mileage operated exceeded 300,000, the actual mileage being 319,146. Records were also established in tonnage and second class passengers carried and total revenue earned.

New Movement Records

Further new records in the movement of chrome, petrol, oils, and lubricants were established by the Rhodesia Railways in December, 1956.

The total tonnage of chrome conveyed during the month was 69,291 tons, of which 58,178 tons were moved through Beira, 6,534 tons through Lourenço Marques and 4,579 tons through the Union. The movement of chrome has shown an upward trend since 1951 when 313,631 tons were moved; this rose to 354,359 tons in 1952 and to 504,102 in 1953. It dropped to 416,194 in 1954, but rose to 487,178 tons in 1955 and to a record of 594,262 tons in 1956.

Another record established during December was in the movement of petrols, oils, and lubricants brought into the country. Altogether a total of 10,030,455 gal. was moved as against the previous best figure of 9,843,791 gal. established in October of last year. Of the 10,030,455 gal. transported, 6,442,259 came through Beira and 3,588,196 through Lourenço Marques.

NEW ZEALAND

New Diesel Shunting Locomotives

The first of 15 diesel shunting locomotives under construction at the Thames works of A. & G. Price Limited for New Zealand Railways was delivered recently, the Minister of Railways, Mr. J. K. McAlpine, officially taking delivery. The firm is supplying 10, 107-h.p. locomotives and five of 150 h.p. The first locomotive, Tr 100, was one of the smaller engines. Others were expected to be delivered at the rate of about one every 10 days.

Yard Improvements at Newmarket

A comprehensive scheme for railway goods yard improvements at Newmarket, recommended by the New Zealand Railways Commission, has been approved by Cabinet. It is part of a wider overall plan to relieve goods traffic congestion in the Auckland area, announced recently by the Minister of Railways, Mr. J. K. McAlpine.

It is proposed to provide a new goods office and goods shed with an adjoining covered platform, erect a long loading shelter, and rearrange the yard so that there will be better access and ample space for manœuvring delivery trucks. A new loading bank will also be provided.

Diesel Passenger Services

From November 26, 1956, when a new railcar service was introduced between Auckland, Taumarunui and New Plymouth, diesel railcars were being operated over 2,040 route miles of the New Zealand railway system. This represents about 80 per cent. of the mileage over which passenger services are provided.

Diesel Traffic on Goods Trains

By September, 1956, diesel locomotives were responsible for 32 per cent of the traffic, measured in gross ton-miles,

Guard's Compartment on Tender for Freight Working

Photo] *[J. H. Price*

Austrian Federal Railways 2-10-0 *locomotive at Graz, with guard's compartment on tender for goods working*

hauled on goods and mixed trains in New Zealand. Compared with the average figures for the year ended March 31, 1954, the average loading of these trains has been boosted by the increasing use of diesel traction from 131 tons to 139 tons. At the same time, the average speed of these new diesel services has risen from 12·28 to 12·74 m.p.h.

CHINA

Progress of North Western Railway

The North Western Railway was extended during the latter half of 1956 and is reported to have reached a point 500 miles south-east of Urumchi, in the province of Sinkiang. The line is planned to be built to Urumchi in 1958, and to link up at that town with a railway running from the U.S.S.R. frontier. Climatic extremes and scarcities of essential commodities such as water, food, and fuel in the Gobi Desert, which the new line traverses, are reported to have added considerably to construction difficulties.

CANADA

All-Purpose Box Cars

An all-purpose box car, the third new freight type car developed by Canadian National Railways in the past year, has undergone its first tests. Designed to provide variable door openings for a variety of commodities, the interior is fitted with movable sidewall sections. Folding panels on heavy-duty hinges make conversion simple. For grain traffic, a 5-ft. 8-in. door opening is available. Loading with fork lift trucks is facilitated by a maximum opening of 15 ft. 6 in. The prototype all-purpose car recently carried its first load of grain on a succesful run between Midland, Ont., and Montreal. It is now being tested in merchandise service. Earlier this year, C.N.R. introduced the pilot model of a new pulpwood car, and more recently has placed 25 double-deck motorcar transporters in service, the first of its type in North America.

ECUADOR

National Railways to Private Ownership

The Government of Ecuador has stated that the State operation of the National Railway has resulted in losses, and the time has come to place the services on a paying basis and to modernise them. The railways have therefore been handed over to a private company. Although the Government will be a stockholder, the company will otherwise function as any other private enterprise under the commercial laws of Ecuador. It is announced that one purpose of placing the railways under private administration was to attract foreign capital needed to modernise and re-equip the system.

TRINIDAD

Future of the Government Railways

The Government recently rejected in principle the report by Mr. Arthur Jessop, who was released by the British Transport Commission, as recorded in our issue of January 6, 1956, to make an investigation into the position of the railways and other transport in Trinidad on behalf of the Government of Trinidad and Tobago. The report recommended inter alia that the Government Railways be closed in stages. Future policy has not been determined, though modernisation in various forms is under discussion.

Passenger traffic is reported to consist largely of schoolchildren, and road competition, largely from taxis, is acute.

GREECE

Two Passenger Classes

The Hellenic State Railways adopted from January 11 the system of two passenger classes already in force throughout most of Europe. Since the Turkish State Railways also changed to the two-class system from January, the only major railway systems in Europe still providing first, second, and third class accommodation are those of Spain and Portugal.

ITALY

Hire of Diesel Shunters

A novel arrangement has been concluded as an experiment between the State Railways and Italian manufacturers. About 20 diesel shunting locomotives are to be supplied to the railways, on which, for a certain number of years, a hire charge will be paid limited to the amount of the economy which will result from the replacement of steam shunting locomotives by diesel. After this period, of about six years, the locomotives become the property of the State Railways without further payment. Maintenance of the locomotives is included in the hire charge. Staff, lubricants, and fuel will be provided by the railway.

Publications Received

Jahrbuch des Eisenbahnwesens (*Railway Year Book*), *1956*. Published by Carl Röhrig Verlag, Darmstadt. 11½ in. by 8 in. 218 pages. Fully illustrated.—This is the seventh issue of this valuable annual, in the same excellent style that marked its predecessors. It contains articles by recognised authorities on the working and finances of the German Federal Railway in 1955, the low-frequency Central European system of single-phase electrification, rails and their physical properties, the operation of local services, and fares and charges, followed by a forecast of what views may be taken in the year 2000 of today's ideas and policies in transport matters. Other articles deal with the railways of Canada, Mexico, and Argentina, with a statistical review of the railways of the world, with mileages, lengths electrified, traffic carried and so on, and useful explanatory comment. One interesting feature is extracts from the recollections of Paul von Breitenbach, a senior officer of the former Prussian State lines and finally Minister of Public Works at Berlin, and Erich Metzeltin, for many years in the service of the locomotive department of the same lines, who came to be Chief Engineer of the well-known locomotive builders Hannoversche Maschinenfabrik, later known as Hanomag.

The Railway. By Edgar B. Schieldrop, with a foreword by Cecil J. Allen, London: Hutchinson & Co. (Publishers) Ltd., 178-202, Great Portland Street, W.1. 9¼ in. x 6¼ in. 256 pp. Illustrated. Price 21s.—The author, a professor of applied mathematics at Oslo University, has traced in broad outline the development of railways from their first small beginnings. The problems with which the railway pioneers had to contend are recalled, and emphasis is laid on the difficulties and dangers encountered in carrying the first transcontinental line in the U.S.A. through wild and undeveloped country. A chapter of particular interest deals with the construction of long bridges and tunnels, and figures are quoted to show the accuracy with which the great bores through the Alps were driven. Modern trends in motive power are discussed, and chapters are devoted to signalling and safety precautions, and to the provision of amenities for passengers. Finally, the author surveys the future with the sympathetic eye of one who is convinced of the permanence of the "permanent way." The many illustrations are well chosen.

Riveting Tools.—A catalogue issued by the Consolidated Pneumatic Tool Co. Ltd., 232 Dawes Road, London, S.W.6, describes the range of riveting tools and accessories manufactured by the company. Tools dealt with range from small aero hammers designed for dealing with ⅛ in. dural rivets to large long-stroke hammers capable of working mild steel rivets up to 1½ in. dia. Details are also given of alternative types of handles available for each model. In another section features of various types of holders-on for different classes of riveting are described.

Cook's Coach Tours Abroad. This 32-page programme of motorcoach tours of Thos. Cook & Son Limited offers a wide variety of scenery in a number of European countries. Travel is by rail between London and the British port, and in a few instances, in the early and concluding stages, on the Continent also.

Testing Tall Structures

In a natural testing-chamber 150 ft. deep facilitating horizontal test forces

SUCH tall structures as marshalling-yard flood-lighting towers, electricity supply pylons, or long crane-jibs are as lightly built as safety permits, and their testing is therefore extremely important.

Hitherto it has been found very difficult to apply horizontal forces to such tall structures on level ground without erecting two other equally tall towers to enable at least two horizontal forces to be applied with their aid to the structure to be tested, one force at right angles to the other.

Now, however, this difficulty has been overcome by Stewarts and Lloyds Limited, who have established a testing site in the Monkey Hole near Wirksworth, Derbyshire, the "hole" being a narrow cleft in a limestone cliff with vertical walls 150 ft. high and a narrow entrance apparently only about 9-10 ft. wide; but it has a clear floor space 100 ft. × 60 ft. Here horizontal forces can be applied at any level up to and even above 150 ft. from the base, and the "hole" provides protection against natural wind-pressure, which in the open can occur unexpectedly and cause overloading.

Test Loads up to 30 Tons

Test loads up to 30 tons are provided for, the anchorages being specially secured in the surrounding rock faces, and can be applied at almost any level or position through tension cables either direct or with bridles spanning between anchorages.

Winches and Switch Gear

To apply the loads as desired at as many as 12 points simultaneously, 12 specially-geared winches are provided. each exerting a pull of 5 tons which with multi-sheave blocks is converted to 30 tons. The gearing ensures a rope-speed of only about 1 ft. 3 in. per min., the winch drum making only half a revolution in that time, though the 2-h.p. motor which drives it runs at 960 r.p.m.

If loads are required at more than 12 points one winch can serve several points, and if loads in excess of 30 tons should be needed a number of winches and anchor-points can be coupled together to provide them.

Control House

The winches and switch gear are housed in a building extending across the end wall of the "hole" opposite the entrance, and the control house is above them. To give a clear view of the test area sloping windows with armour plate glass are provided. The control desk has two wings, each having its own operator who controls six winches with forward and reverse push-buttons, the appropriate one having to be continuously held down throughout the time the winch is working. Loads at the selected points are indicated by 12 dials, and other dials show deflection at 10 points on the structure under test. A third, the master-operator can communicate by microphone with all parts of the test site, and he has master-buttons (1) to stop everything by cutting off power from the winches, and (2) to release all loads simultaneously.

Pullmeter Measurement

To measure the loads applied, special "pullmeters" developed by the Research & Technical Development Department of Stewarts and Lloyds are installed. The pullmeter is a differential transformer measuring minute linear displacement in the elastic extension of the tubular outer casing of the instrument as the load is applied. The load is proportional to this extension and is indicated by the instrument in tons. The instrument operates on ordinary 50-cycle mains with relatively large currents. Its sensitivity is such that any change in load of one part in a thousand is recorded. Each has a number of ranges up to 2, 5, 10, or 30 tons and an associated range unit can be plugged into the control desk. By this system the load on any rope or winch is known at any time and therefore there is no danger of overloading.

ADDITIONAL TELEPHONE NUMBER FOR B.I.C.C. LIMITED.—British Insulated Callender's Cables Limited announce that their depot at Camden Street, Derby, now has an additional telephone number: Derby 44282.

Monkey Hole structures testing station of Stewarts and Lloyds Limited near Wirksworth, showing 275-kV. tower under test

Track Loading Fundamentals—2*

Determination of rail section

By C. W. Clarke, M.I.C.E., M.I.Mech.E., M.I.E.Aust., M.Inst.T.

STEEL rails of British manufacture are to B.S.9 and B.S.11. The tests specified are for ultimate tensile stress, elongation and a falling weight test. The yield stress is not specified. The ultimate tensile limits specified are 44 to 55 tons per square inch and physical tests indicate the yield stress and endurance limit as being about 60,000 pounds per square inch. Rails manufactured in the U.S.A. generally contain a higher carbon content, and consequently have a higher ultimate tensile stress and yield point, but lower ductility.

In service the metal must never be stressed beyond the elastic limit, otherwise permanent damage is done. According to the latest ideas allowable stresses are related to the yield point stress and endurance limit rather than the ultimate tensile strength of the steel used. Young's modulus of elasticity for all steels is practically constant. Composition and heat-treatment have little effect and the value is approximately the same under impact as it is under static loading. Under impact the elastic limit appears to be higher, but at extremely high speed impact the capacity of steel to absorb energy without rupture is considerably less than under impact at moderate speed. When considering rail stresses, the conditions of extremely high speed impacts are attained at rail joints.

Besides ensuring that the tensile stress in a rail does not exceed the allowable stress in service, it is necessary to ensure that the rail does not fail due to other causes. Failure by an actual shear fracture is unlikely to occur in any steel beam, but failure by buckling of the web can occur from vertical compression under a concentrated load or to diagonal compression when the shear stress reaches a certain value. The rail head must not crush, and therefore the width of rail head, wheel load and minimum diameter of wheel come into consideration. The Americans have demonstrated that wheel loads up to 17 tons can be carried and run at speeds exceeding 80 m.p.h., so that provided a rail section is correctly proportioned failure by shear or crushing or local stresses is improbable, although in time the local stresses, particularly those resulting from high contact stresses, may result in fatigue of the metal and failure of the rail due to incipient cracks.

In the head of a rail, reverse bending occurs due to concentration of load and the stresses within a few inches either side of the wheel load are quite different from those calculated by the ordinary bending theory. The section of the rail head needs to be considered as a continuous member supported on an elastic foundation, which in this case is the web of the rail. The result of this reverse bending is a concentration of stress in the fillet under the rail head.

In addition to reverse bending the contact pressure between a wheel and rail produces local stresses in the head of the rail which are referred to as Hertzian stresses and may be a factor in hastening certain types of rail failure, especially in the case of drives with axle-hung motors without resilient gear wheels or steam locomotives with excessive hammer-blow. The contact area between a wheel and rail is elliptical, with the major axis in the direction of travel, and the area increases as wheel diameter increases. The intensity of contact pressure resulting from a small wheel can exceed that due to a wheel of larger diameter carrying a heavier load, and may result in plastic flow of the rail head. The stresses produced depend on the ratio J_v/D. The method of computing Hertzian stresses is given in *University of Illinois Bulletin No. 212, Vol. XXVI, 1930*, and is based on static wheel loads. It neglects track modulus, speed effect and increase due to dynamic loads. Furthermore, the transverse radius of the head of a rail soon alters as a result of wear under traffic. In practice it seems that if the ratio J_v/D does not exceed 600 for 45-lb. rails rising to about 850 for 100-lb. rails, it is unlikely that rail failures will result from Hertzian stresses. Plastic flow of the rail head is more likely to occur when the track foundation is firm and unyielding, such as sleepers laid direct on short span steel girders, and is more apparent on firm than on light track.

With rails of American manufacture, which generally have a higher carbon content, higher wheel loads can be carried before signs of metal flow appear. On the meagre data available it is difficult to determine whether the incidence of rail failures is higher in the U.S.A. or the U.K., but it would appear that rails of British manufacture, probably owing to their higher ductility, have a lower incidence of rail failures.

Effect of Motion

The various local stresses produced in a rail are difficult to calculate with any degree of accuracy. If the rail stresses produced by a vehicle under static conditions are determined, there is an increase in the stress values when the vehicle passes over the rail at speed. This is due to the perturbations of the vehicle which produces stresses due to lateral bending of the rail, eccentric vertical loading, torsion, transfer of load due to rolling, vertical impact due to speed, rail joint effect, rail vibrations and stresses due to track irregularities, etc. Various authorities have attempted to make allowances to provide for these factors, but the variables involved are numerous, and no calculations of stress and deformation in railway track can be regarded as exact.

A formula used by the Indian Railways[1] to provide for the effect of the perturbations of a vehicle at speed, which allows for local stresses and stresses due to lurching, rolling, vertical impact, vibration of the rail, etc., is an impact factor given by

$$K = \frac{V}{3\sqrt{U}} \quad \ldots\ldots\ldots\ldots \quad (36)$$

and although purely an empirical factor agrees closely in practice.

To the static wheel load the increment due to speed effect must be added in computing rail stresses. In addition, increments of wheel loads due to such factors as hammer-blow and vertical component of connecting rod thrust in the case of a steam locomotive, and alteration in wheel loads due to torque reaction in the case of motor-driven axles, must be added algebraically to the static wheel load values, to give the adjusted or live load values.

The traction augment in the case of a steam locomotive is the vertical component of the thrust on the connecting rod, commonly known as steam effect. In the case of motor-driven wheels it is the transference in wheel loads due to torque reaction, and this can be appreciable, especially at starting, but diminishes as speed increases. The traction augment must be computed and added to or subtracted from individual wheel loads as the case may be. In Bo-Bo and Co-Co type wheel arrangements the effect is to lighten the load on the leading wheels and increase the load on the trailing wheels of each bogie. As the leading wheels are usually the critical wheels in such cases, the greatest rail stresses at speed are produced when the locomotive is coasting with power cut-off, and it is advisable to consider rail stresses at speed for any Bo-Bo or Co-Co type locomotive for conditions when the locomotive is coasting. With suitable bogie design the transference in weight due to torque reaction can be reduced.

Then the effect of adjacent wheels must be considered, because if they are relatively close-spaced they afford considerable relief of rail stresses. Instead of a graphical method of analysis, an analytical treatment can be made, and to facilitate the work standard charts as shown in Figs. 3 and 3a can be prepared and used. Consideration of the effect of relief of stress due to close wheel spacing shows how meaningless it is to specify the maximum static wheel load permitted to run on a track. So far as rail stresses are concerned, in a closely-spaced wheelbase it is possible to increase the static loads on the inner wheels considerably without increasing rail stresses.

* Part 1 appeared in our issue of January 11

The Talbot load for speed 0+ can be expressed mathematically as

$$TL_0 = (P + H_0 + T_0)F \text{ lb.} \quad \ldots\ (37)$$

and for permitted speed V as

$$TL_v = [P(1 + K) + H_v + T_v]F \text{ lb.} \quad \ldots\ (38)$$

It should be noted that the speed factor is applied only to the static load, and the hammer-blow and traction augment are added algebraically for each wheel, since they are dynamic additions to the live load. The co-efficient for stress relief applies to a specific wheel and denotes relief of stress afforded by neighbouring wheels. The value can be more favourable than 0·5, giving a relief of stress due to the proximity of other wheels, in some cases to over 50 per cent.

distance ahead of the leading wheels, and analysis of rail stresses is based on the assumption that the rail supports are capable of developing negative reactions. In practice there is often play between the rail foot and the dogspikes, with the result there is little resistance to the upward movement of the rail and the stress in the rail can be increased by about 10 per cent. Where the condition of the sleepers is poor the increase in rail stresses might even exceed this amount. Experimental recordings confirm a proportionately higher rail stress due to leading wheels. Therefore, it is considered the rail stress values produced by a leading wheel should be limited to 90 per cent of the values permitted for following wheels.

Similarly, for twin-bogie type loco-

This can be expressed by the equation

$$\frac{0{\cdot}318\ TL_v \cdot X_1}{Z} \leqq 0{\cdot}5 \text{ yield stress} \quad \ldots\ (39)$$

which for rails of British manufacture gives

$$\frac{0{\cdot}318\ TL_v \cdot X_1}{Z} \leqq 30{,}000 \text{ p.s.i.} \quad \ldots\ (40)$$

when

$$TL_v \leqq 94{,}300\ Z/X_1 \text{ lb.} \quad \ldots\ (41)$$

If the problem is to determine the rail section required to carry a specified Talbot load at speed V, then from equation 41

$$Z = \frac{TL_v \cdot X_1}{94{,}300} \text{ in.}^3 \quad \ldots\ (42)$$

and having determined the section

PER-WAY LOADS (SPEED O+)

TRACK DATA RAILS 60 lb. I = 16·26 in.⁴ Z = 7·04 in.³ U = 1000 lb./in./in., X_1 = 29·4 in.

VEHICLE CLASS PR 4-6-2 STEAM LOCO

WHEEL No. AND LOAD — TONS	RAIL — STRESS DETERMINATION								FORMATION LOADING DETERMINATION							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
	← 72"	49"	60"	60"	101"	114·5" → JC			← 72"	49"	60"	60"	101"	114·5" → JC		
STATIC LOAD = P	2·92	2·92	7·00	7·00	7·00	5·15	5·01		2·92	2·92	7·00	7·00	7·00	5·15	5·01	
TRACTION AUGMENT = T_0				1·65								1·65				
ADJUSTED WHEEL LOAD = J_0	2·92	2·92	7·00	8·65	7·00	5·15	5·01		2·92	2·92	7·00	8·65	7·00	5·15	5·01	
USING MASTER DIAGRAM AND X_1 = 29·4 in.																
EFFECT OF 1	2·92	-0·55	-0·10						2·92	-0·29						
" " 2	-0·55	2·92	-0·57	-0·19					-0·29	2·92	+0·93	-0·17				
" " 3	-0·24	-1·38	7·00	-1·45	-0·26					+2·24	7·00	+1·33	-0·31			
" " 4		-0·56	-1·80	8·65	-1·80					-0·35	+1·65	8·65	+1·65			
" " 5			-0·26	-1·45	7·00	-0·64					-0·31	+1·33	7·00	-0·17		
" " 6					-0·47	5·15	—						-0·13	5·15	—	
" " 7						-0·25	5·01							-0·25	5·01	
" " 8																
EQUIV. WHEEL LOAD = E_0	2·13	0·43	4·27	5·56	4·47	4·26	—		2·63	4·52	9·27	11·14	8·21	4·73	—	
TALBOT WHEEL LOAD = TL_0	5·56 tons, plus 10% for a L.A. = — tons (12,454 lb)								ZIMMERMANN WHEEL LOAD = ZL_0			11·14 tons (24,953 lb)				

Fig. 3—Standard forms to determine values at speed O+

The build-up in wheel load and the effect of the coefficient for stress relief for the driving wheel of the 4-6-2 type steam locomotive considered is shown diagrammatically in Fig. 4. Note that the trailing coupled wheel is the critical wheel for this locomotive, and the maximum speed before allowable rail stress values would be exceeded is about 67 m.p.h. This diagram can be used to indicate maximum speed permissible without increasing allowable rail stress values. It is not strictly accurate because the hammer-blow and traction augment do not vary with speed according to a straight line law. However, the error is small in practice, and if greater accuracy is required, values should be computed.

Lift of Rail

The particular case of the leading wheels of a locomotive needs consideration. Due to the wave-like effect in the rails with the passage of a train, the rail tends to bend upwards at some

motives and bogie vehicles, if the leading axle of the trailing bogie is so far removed from the trailing axle of the leading bogie that the track rises above its normal datum level before being depressed again by the following wheels, the maximum wheel load permitted should not exceed 90 per cent of the value otherwise permitted. These conditions apply in general to all axles spaced a distance greater than $6X_1$ from the axle ahead, and to the last axle in a train.

To provide for indeterminate increases in rail stresses and unknown stresses which might occur due to flogging or decayed sleepers, low spots, irregular alignment, worn rails, temperature effect, etc., it is considered that the allowable flexural stress value in the base of the rail axis, computed from the Talbot load at permitted speed, should not exceed 50 per cent of the yield stress of rail steel, i.e. 30,000 p.s.i. (13·4-tons per sq. in.) for rails of British manufacture.

modulus the required weight of rail can be readily selected.

The value for the static Talbot load would be

$$TL_0 = TL_v/(1 + K) \quad \ldots\ (43)$$

and Fig. 5 shows the values of TL_v and TL_0 computed from equations 41 and 43 for permissible speeds of 45 and 60 m.p.h. respectively, on 60-lb. and 80-lb. rails. The allowable values of TL_v for various rail sections would be as shown in Table 1.

Table 1—Allowable Values of TL_v for Various Rail Sections

Rail	Allowable TL_v Value
B.S. 45R F.F.	15,500 lb. or 6·9 tons
B.S. 60R F.F.	22,600 lb. or 10 tons
B.S. 80R F.F.	29,700 lb. or 13·3 tons
B.S. 95R F.F.	41,500 lb. or 18·5 tons

In computing the rail section to be used, the Talbot load as permissible speed is the determining factor. The lower Talbot load value for static con-

PER – WAY LOADS (SPEED V) MAX: SERVICE SPEED V = 45 m.p.h.

TRACK DATA RAILS 60 lb. I = 16·26 in.⁴ Z = 7·04 in.³ U = 1000 lb./in./in., X_1 = 29·4 in.

ALLOWABLE RAIL STRESS f_o = 30,000 p.s.i., SLEEPER SPACING S = 32 in., SLEEPER SIZE 7′-0″ x 9″ x 4½″, BALLAST LIFT d = 6 in.

GAUGE 3′-6″ FACTOR $K = \left(\frac{V}{3\sqrt{U}}\right)$ = 0·474 RAIL-SEAT LOAD CARRIED SAFELY ON THIS TRACK q_o = 14000 lb.

VEHICLE CLASS PR 4-6-2 STEAM LOCO. FACTOR $K_B \left(\frac{V^2}{12000}\right)$ = 0·17 BEARING PRESSURE ALLOWABLE ON ROADBED p_a = 15 p.s.i.

WHEEL No. AND LOAD – TONS	RAIL – STRESS DETERMINATION								FORMATION LOADING DETERMINATION							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
	⊢ 72″	49″	60″	60″	101″	114·5″ ∞			⊢ 72″	49″	60″	60″	101″	114·5″ ∞		
STATIC LOAD = P	2·92	2·92	7·00	7·00	7·00	5·15	5·01		2·92	2·92	7·00	7·00	7·00	5·15	5·01	
IMPACT FACTOR = K or K_o	1·38	1·38	3·32	3·32	3·32	2·44	2·38		0·49	0·49	1·19	1·19	1·19	0·87	0·85	
TRACTION AUGMENT = T_v				0·97								0·97				
HAMMER BLOW = H_v			1·68	1·68	1·68						1·68	1·68	1·68			
LIVE WHEEL LOAD = J_v	4·30	4·30	12·00	12·97	12·00	7·59	7·39		3·41	3·41	9·87	10·84	9·87	6·02	5·86	
USING MASTER DIAGRAM AND X_1 = 29·4 in.																
EFFECT OF 1	4·30	−0·82	−0·15						3·41	+0·34	−0·15					
" " 2	−0·82	4·30	−0·84	−0·29					+0·34	3·41	+1·09	−0·14				
" " 3	−0·42	−2·34	12·00	−2·49	−0·42				−0·44	+3·16	9·87	+1·88	−0·44			
" " 4		−0·80	−2·70	12·97	−2·70					−0·43	+2·06	10·84	+2·06			
" " 5			−0·42	−2·49	12·00	−1·14					−0·44	+1·88	9·87	−0·25		
" " 6					−0·72	7·59	—						−0·15	6·02	—	
" " 7						−0·37	7·39							−0·26	5·86	
" " 8																
EQUIV. WHEEL LOAD = Σ_v	3·06	0·34	7·89	7·70	8·16	6·08	—		3·31	6·48	12·43	14·46	11·34	5·51	—	
TALBOT WHEEL LOAD = TL_v	8·16 tons, plus 10% for a L.A. = — — tons (18,278 lb.)								ZIMMERMANN WHEEL LOAD = ZL_v			14·46 tons (32,390 lb.)				

$f_o = 0{\cdot}318\ TL_v . X_1 / Z$
$= 0{\cdot}318 \times 18{,}278 \times 29{\cdot}4 / 7{\cdot}04$
$= 24{,}300$ p.s.i.

$C = TL_v / P$
$= 18{,}278 / 15{,}680$
$= 1{\cdot}16$ at 45 m.p.h.

$Q = 19{\cdot}5$ in.
$L = 2Q\left(1 - \frac{0{\cdot}0360}{\sqrt[4]{I^3}}\right)$
$= 30{\cdot}0$ in.
$c = (0{\cdot}48 + 0{\cdot}01\,b)$
$= 0{\cdot}57$
$R = c.bL.d$
$= 925$ in.²

$q_o = 0{\cdot}39\ ZL_v . S / X_1$
$= 0{\cdot}39 \times 32{,}390 \times 32 / 29{\cdot}4$
$= 13{,}750$ lb.

$p_a = q_o / R$
$= 13{,}750 / 925$
$= 14{\cdot}85$ p.s.i.

$C_o = ZL_v / P$
$= 32{,}390 / 15{,}680$
$= 2{\cdot}06$ at 45 m.p.h.

Fig. 3a—Standard forms to determine values at speed V

ditions would be computed from equation 43. The actual wheel loads permitted depend on wheel spacing and may be greater than the latter value in a close-spaced wheelbase, owing to relief of stress afforded by neighbouring wheels.

The allowable flexural stress produced by the Talbot load is limited to 0·5 the yield stress value, and accords closely with the value given by G. M. Magee for American practice, which allows

Locomotive factor ..	5 per cent
Steam effect	3,000 p.s.i. in rail stress
Lateral bending ..	15 per cent
Temperature stress factor	7,000 p.s.i. in rail stress
Rail wear factor ..	10 per cent
Unbalanced superelevation	15 per cent
Track condition	25 per cent

Taking 60,000 p.s.i. as the yield point stress for steel rails, this gives

$$\frac{60{,}000 - (3{,}000 + 7{,}000)}{1{\cdot}00 + 0{\cdot}05 + 0{\cdot}15 + 0{\cdot}10 + 0{\cdot}15 + 0{\cdot}25} = 29{,}412 \text{ p.s.i.} \quad \ldots\ldots\ldots (44)$$

The value given by equation 40 can be expressed as

$$30{,}000 = \frac{26{\cdot}17 \times TL_v}{Z} \sqrt[4]{\frac{I}{U}} \quad \ldots\ldots (45)$$

and since the stress in a rail varies inversely as the fourth root of U and variation in U has not a great effect on the bending moment or stress produced in a rail, the value of U might be taken as U = 1,000, when equation 45 can be expressed as

$$30{,}000 = \frac{26{\cdot}17}{\sqrt[4]{1{,}000}} \cdot \frac{TL_v}{A} \cdot \frac{A\sqrt[4]{I}}{Z} \quad \ldots\ldots (46)$$

and since the first factor is a constant and the third factor remains constant for geometrically similar cross-sections, the stress is inversely proportional to the cross-sectional area, i.e., weight of rail per unit length.

If B.S. flat-bottom rails are considered, it can be taken they are homologous and their cross-sections are approximately geometrically similar, so that in practice the rail stress is proportional to the section modulus or approximately proportional to the weight of rail per yard. The stiffness of a rail is ample if the strength is sufficient for the service.

Instead of equation 45 it may be more convenient to express the value related to the weight of B.S. flat-bottom rails, when for rail sections of 60-lb. to 80-lb. per yard

$$TL_v = 370\ W \text{ lb.} \quad \ldots\ldots\ldots (47)$$

$$= 0{\cdot}17\ W \text{ tons} \quad \ldots\ldots\ldots (48$$

These values apply only within the limited range of rail section considered, since they increase as weight of rail and track modulus increase. The corresponding static value TL_o is computed as shown in equation 43, and the more accurate value of TL_v computed from equation 41 should be used

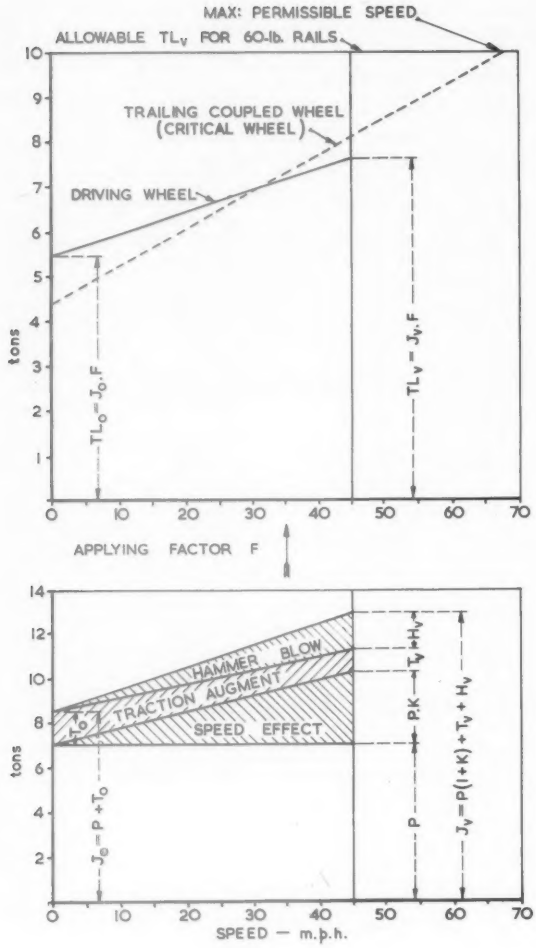
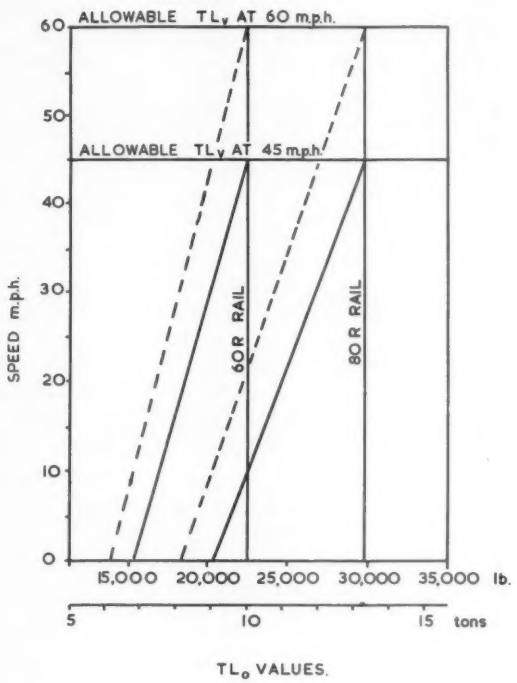


Fig. 4 (left)—Build-up of loads in driving wheel for a 4-6-2 locomotive

Fig. 5 (below)—Allowable TL_v and TL_o values for 60-lb. and 80-lb. rails



for any particular rail section and track modulus.

Sleeper Spacing

The stresses in a rail are not greatly effected by altering the sleeper spacing. The reduction in bending moment is proportional to X_1 and experiments[2] confirm that for all practical purposes track modulus varies inversely as sleeper spacing and from equation 10

$$X_1 \text{ varies as } \frac{1}{\sqrt[4]{U}} \quad \ldots\ldots\ldots (49)$$

and

$$U \text{ varies as } \frac{I}{S} \quad \ldots\ldots\ldots\ldots (50)$$

when

$$X_1 \text{ varies as } \sqrt[4]{S} \quad \ldots\ldots\ldots (51)$$

which shows that the bending moment and rail stress vary as the fourth root of sleeper spacing. Doubling the number of sleepers per mile of track reduces rail stresses only by about 19 per cent. It follows that if rail stresses are too high for a given Talbot load, it would be uneconomical to consider increasing the number of sleepers per mile, and the correct action would be to increase the weight of rail to be used. When selecting the weight of rail to be used the natural tendency to increase loads and speeds as traffic volume increases should be borne in mind. Whereas cost increases directly as the weight of a rail, both stiffness and strength increase at a greater rate, so that better value is obtained per unit of expenditure in buying a heavier rail section. For example, if 60-lb. and 80-lb. rails are considered, the heavier rail would cost 33 per cent more per mile of track, but the increase in stiffness would be about 80 per cent and increase in strength 53 per cent. The annual maintenance cost per mile of track probably would be reduced by over 33 per cent, but as the weight of steel in the rails alone generally exceeds three times the weight of the entire rolling stock of a railway, capital outlay must be considered carefully when selecting the weight of rail to be used.

The load which can be carried at a rail joint might now be considered. At rail joints sleeper spacing is generally reduced to compensate for the inherent weakness of the joint. From equation 21 it is apparent that if the flexural stress in the fishplates is not to exceed that allowed for the parent rail, then the ratio X_1/Z must remain constant, or from equation 51 the ratio $\sqrt[4]{S/Z}$ must remain constant. This means that for the same Talbot load sleeper spacing varies as the fourth root of the section modulus. The section modulus of a pair of fishplates is about one-half that of the parent rail, so that if normal sleeper spacing is 30 in., sleeper spacing at the joints should be

$$30 \sqrt[4]{\frac{1}{2}} = 25 \text{ in.} \quad \ldots\ldots\ldots (52)$$

It will be shown later that sleeper spacing at rail joints is dependent on rail-seat loads, and the moment of inertia of a pair of fishplates rather than section modulus determines sleeper spacing at a joint. As this value is always less than that computed from equation 52, the Talbot load permitted at a rail joint can be equal to that computed for the parent rail section. The fishplates for British rail sections are standardised, but investigation into the strength of fishplates may be made[3] if a particular design is considered to be weak.

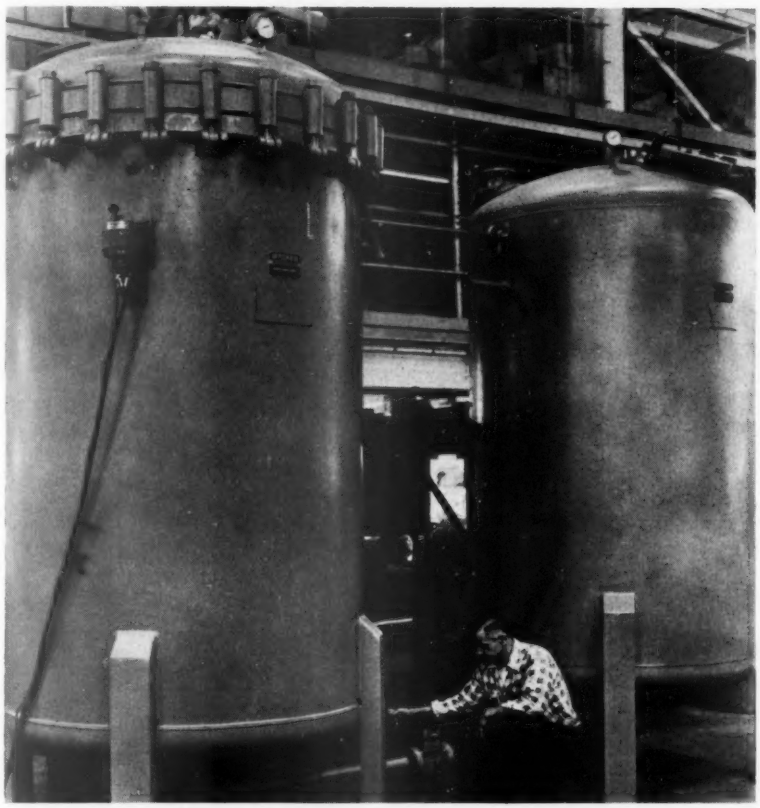
In British and Continental practice the joints are usually square, with sleeper spacing closer towards the ends of rails. In American practice the

(*Continued on page* 107)

Insulating Varnish Impregnating Plant for Pakistan

For armatures and field coils of electric and diesel-electric locomotives

A VACUUM impregnating plant of exceptional dimensions has been built for the North Western Railway, Pakistan, and will shortly be placed in service at Karachi. The equipment was built by the F. J. Stokes Corporation, Tabor Road, Philadelphia, 20, P.A. U.S.A., the order being placed through the Commercial Division of the Embassy of Pakistan, Washington. The plant, which is shown in the accompanying illustration, will be used to impregnate with insulating varnish, the armatures and field coils of diesel-electric traction motors.



The impregnating plant undergoing tests at the maker's works

Penetration of Varnish

Impregnation with the aid of vacuum ensures deep and thorough penetration of the insulating varnish into the electrical windings, and is an essential feature in the manufacture or repair of traction motors, ensuring a long service life of the equipment between overhaul. The tank on the left of the illustration, the impregnating chamber, has an inside dia. of 4 ft. 10 in. and is nearly 9 ft. high, and provides a maximum immersion height of 7 ft. 3 in.

Components to be impregnated are lowered into this chamber and the hinged lid sealed, vacuum is drawn within the chamber by pumping out the air, so removing any traces of moisture which may be present in the inner surfaces of the electrical windings. Glyptal insulating varnish is then admitted to the impregnating chamber from the reservoir shown on the right, by means of a valve and piping which connects the impregnating chamber with the reservoir which has a storage capacity of 1,120 gal.

The varnish rises in the impregnating chamber until it completely covers the components. Because of the absence of air the varnish penetrates deeply into the windings. Air under pressure is then applied to the surface of the impregnating chamber to accelerate the penetration. Components are then removed from the vacuum chamber and the varnish is dried to a maximum hardness by baking slowly for approximately 18-hr. at a temperature of 140 to 150° C.

Components are then given a further coat of red enamel Glyptal varnish by dipping them, this is followed by a further baking for another 12 to 18-hr. at 120-150° C. Both the impregnating chamber and reservoir are fabricated by welding.

Track Loading Fundamentals—2

(*Concluded from page* 106)

joints are staggered with sleeper spacing constant throughout, but in America sleeper spacing is closer, being about 20 in. compared with 30 in. in Britain and the Continent. It is comparatively recently the Americans adopted the practice of canting rails inwards, generally at 1 in 40, but many miles of tangent track in the United States of America are still laid with vertical rails. The Queensland Railways are the only Australian system which adheres to vertical rails on tangent track. The provision of inward cant helps to bring the thrust on the rail-seat more in line with the axis of the rail section. Whereas in America and Australia the rails are always vertical at turnouts, in British practice the inward cant of 1 in 20 is maintained at points and crossings, and for high speed tracks super-elevation is run-out on the turn-out. The American practice simplifies design and construction of turn-outs; on the other hand the British practice results in smoother riding of vehicles.

BIBLIOGRAPHY

[1] Report of the Bridge Sub-Committee on Track Stresses, 1925. Technical Paper No. 245, Indian Railways

[2] "Sleeper Spacing and Its Effect on the Maximum Permissible Axle Load." A. F. Harvey, 1925, Technical Paper No. 244, Indian Railways

[3] "Investigations into the Strength of Rail Jonts." H. Howe and L. H. Swain, 1931. Technical Paper No. 276, Indian Railways

(*To be continued*)

BRITISH STANDARD FOR ARCHITECTS', ENGINEERS', AND SURVEYORS' BOXWOOD SCALES.—The principal differences between the original standard and the revised edition B.S. 1347:1956, are that the scales used by architects and engineers and by quantity surveyors are now given in one publication and that all the information for each scale is given in one item of a table. This new arrangement has made possible the allocation of a reference number to each scale and this should prove a great boon to purchasers and suppliers, as misunderstandings and misinterpretations of orders should be eliminated. The standard lists 94 scales in common use, and full details of the figuring for each are given in a table. Copies of this standard may be obtained from the British Standards Institution, Sales Branch, 2, Park Street, London, W.1. Price 5s.

Scottish Region Training School

For providing apprentice intake at St. Rollox, and Cowlairs Works, and the motive power depots in Glasgow

Machine shop section, showing layout of machine units

WITH the object of providing an intake of apprentices for St. Rollox and Cowlairs Works, and the Motive Power Depots in Glasgow, the Scottish Region, British Railways, opened a Pre-Apprentice Training School at 348, Parliamentary Road, Glasgow, on November 16 last. The building has three floors, the first of which accommodates the chief instructor, secretary, smithing, welding, and moulding sections, ablutions, and store. On the first floor is situated the fitting and assembly, machining, electrical, and sheet metal workshops, while on the second floor are the classroom, and the woodworking, trimming, and paint shops.

Curriculum

Accommodation is available in the classroom for 32 trainees, and at full capacity the school will house approximately 100. An intake of about 30 is made every four months. The training scheme provides both practical and theoretical instruction for boys from their engagement up to the age of 16, when their apprenticeship proper commences. Approximately two-thirds of the time in the school is spent on practical work, which is divided into four main sections consisting of (1) electrical, sheet metal work, and coppersmithing; (2) turning, machining, fitting and assembly; (3) smithing, forging, moulding, coremaking, electrical, and oxy-acetylene welding; (4) joinery, coach finishing, patternmaking, painting, sign-writing, polishing, and trimming.

Each section operates under the supervision of a competent workshop instructor; approximately 27 hr. a week are spent on practical work, and 12 hr. are spent in theory. In planning the curriculum for the theoretical work care has been taken to draw up a course which is complementary to the National Certificate Course and City & Guilds of London Institute Courses.

The school is a full-time day school, and apprentice trainees are paid the standard scale rate for juniors, and on the termination of the training period, are transferred to the works or motive power depots; training is continued up to the age of 21 years; the apprenticeship is covered by an indenture. Co-operation of the Glasgow Education Department with British Railways provides for professional lectures in mathematics, science, drawing, English, and geography.

The policy in respect of the curriculum and general scope of the school is the responsibility of the Chief Mechanical Engineer, and the Carriage & Wagon Engineer, and is administered through a committee of works managers; close liaison is maintained with the Glasgow Education Department.

Workshop instructors have undergone a teachers' training course at a residential training college established by British Railways.

Trainees receiving instruction in the fitting section

Drawing lesson, part of the technical training

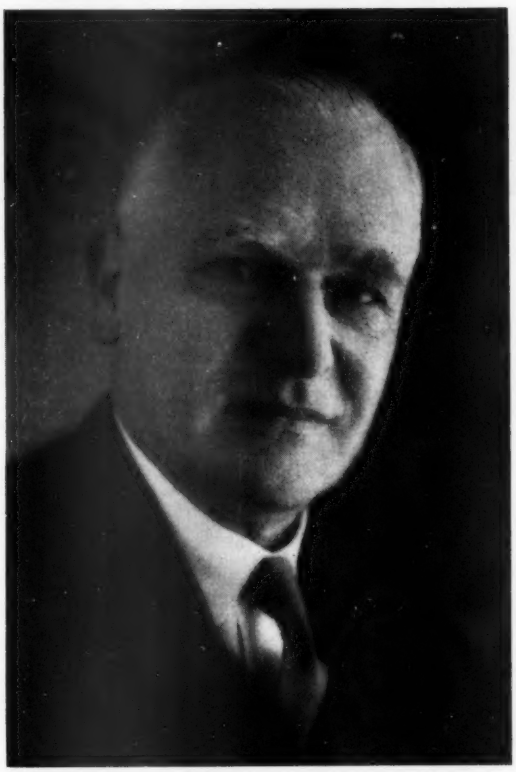
RAILWAY NEWS SECTION

PERSONAL

Mr. G. R. Nugent and Mr. A. M. S. Neave have been appointed Joint Parliamentary Secretaries to the Ministry of Transport & Civil Aviation *vice* Mr. Hugh Molson and Mr. John Profumo.

Mr. Reginald F. Hanks, M.I.Mech.E., who, as recorded in our January 18 issue, has been appointed a part-time Member of the British Transport Commission, is Chairman of the Western Area Board of that body. Mr. Hanks was born on April 27, 1896, and educated at New College School, Oxford. He received his engineering training at the G.W.R. Locomotive Works, Swindon, and Oxford City and North Wilts technical schools. During the 1914-18 war he served with the B.E.F. in France from 1915 to 1919. In 1922, after a period with the Crown Agents for the Colonies as an Assistant Engineering Inspector in Glasgow, he joined the service technical department of Morris Motors Limited. In 1947, when Managing Director of Nuffield Exports Limited, he was appointed Vice-Chairman & Managing Director of the Nuffield Organisation, and has been a Director of the British Motor Corporation since its inception. He is a Vice-President of the Society of Motor Manufacturers & Traders and a Member of the National Advisory Council for the Motor Industry. Mr. Hanks has filled the positions of Assistant Service Manager, Chief Inspector, and Production Manager of Cars Branch of Morris Motors Limited. In 1940 he became Manager of the R.A.F. Civilian Repair Organisation and, from 1941 to 1945, was Director & General Manager of Nuffield's Mechanisations Limited, first in Birmingham and later in Coventry. In 1945 he joined Nuffield Exports Limited. He was appointed an additional Member of the Western Area Board of the B.T.C. in May, 1955, and assumed the Chairmanship of that body on July 1 the same year.

Mr. Reginald F. Hanks
Appointed a Part-Time Member of the B.T.C.



Mr. H. G. Bowles
Appointed Assistant General Manager (Administration), Western Region

Mr. H. G. Bowles, who, as recorded in our January 18 issue, has been appointed Assistant General Manager (Administration), Western Region, British Railways, entered the service of the Great Western Railway in the Goods Department at Paddington in 1913. He later had seven years' general experience in the Reading district, including a period of training in the Traffic Department, and, in 1923, was appointed to the General Manager's Office, where he obtained extensive experience of the major questions arising from the administration of the railway and its ancillary and associated undertakings. For five years he had charge of the section dealing with freight rates and charges, passenger fares, rolling stock and stores, statistics and accounts and docks, marine and general traffic subjects, and, in April, 1946, he became Chief Clerk to the General Manager. On nationalisation, he was appointed Assistant to the Chief Regional Officer, Western Region, and, in May, 1949, became Acting Assistant Chief Regional Officer, being confirmed in that appointment in January, 1950. While in this position he was appointed Chairman of a committee set up by the former Railway Executive to consider the future scope for the employment of Light Weight Trains. After comprehensive investigations, this committee recommended experiments with diesel multiple units. Following the organisational changes which followed the Transport Act, 1953, Mr. Bowles was, in February, 1954, appointed Principal Assistant to the Chief Regional Manager (subsequently re-designated General Manager). He has been Chairman of the Regional Diesel & Suggestions Committees, and recently accepted an invitation to act as contact officer for the British Transport Commission with the Universities of Bristol, Wales, and Exeter.

Mr. James Masters has been appointed Assistant Vice-President, Finance, of the Canadian Pacific Railway.

Mr. R. G. Da Costa, Railway Adviser to the High Commissioner for India, is returning to India to take up another appointment. He will be succeeded by Mr. L. T. Madnani, Joint Director (Mechanical Engineering), Indian Railway Board.

Lord Douglas of Kirtleside has been re-appointed Chairman of British European Airways for a further period of three years from March 14, 1957. Lord Douglas has been Chairman of B.E.A. since March, 1949.

Mr. T. D. Slattery

General Traffic Manager, British & Irish Railways, Inc., N.Y., 1944-57

Mr. George F. Luther

Appointed General Traffic Manager, British & Irish Railways, Inc., N.Y.

Mr. F. T. Gray

Appointed Assistant Director of Costings, British Transport Commission

Mr. T. D. Slattery, General Traffic Manager, British & Irish Railways, Inc., New York, who, as recorded in our January 4 issue, has retired for reasons of ill-health, obtained his early training with the former L. & Y.R. On the formation of the L.M.S.R. in 1923 he was appointed to the personal staff of the General Superintendent (Passenger Commercial) at Derby, and, in 1928, took up a new position as L.M.S. Travelling Passenger Agent in the U.S.A. and Canada. Mr. Slattery was closely associated with the historic tour of the L.M.S. "Royal Scot" locomotive and train through the United States and Canada in 1933, travelling with it throughout. On the merging of all the British and Irish railway companies' interests on the North American continent, he became responsible for the fieldwork in the group companies' interests. In 1936 he returned to the U.K. to become Passenger Assistant to the District Goods, Passenger & Docks Manager at Barrow-in-Furness, and, in November, 1938, was appointed Deputy Research Assistant to the Chief Commercial Manager at Euston. He also became a lecturer in commercial subjects at the L.M.S. School of Transport. On the outbreak of war Mr. Slattery was posted to emergency duties in London and later to special assignments connected with the war effort. He returned to New York in 1944 to take up the position of General Traffic Manager, and since that time the offices of British & Irish Railways have re-opened and expanded in New York, Chicago, Los Angeles, and Toronto. Keenly interested in all travel problems, he is well known for his activities on behalf of the Allied Membership of the American Society of Travel Agents. At Annual Conventions of A.S.T.A. he was elected General Chairman of the Allied Membership for five successive years, during which time he was the recipient of several awards from the industry and from foreign governments. When pressure of business caused him to relinquish this position in 1953 he was, at the Miami Convention, honoured by being elected Honorary General Chairman, in which capacity he has continued to serve until the present time. Since their commencement he has supported the A.S.T.A. Schools for Travel Agents, having lectured both in New York and Chicago. Mr. Slattery has been Chairman of the Conference of European Railway Representatives; President of the New York Chapter of Skal, and for over 10 years, Treasurer & Executive Member of the British Commonwealth Chamber of Commerce in New York City.

Mr. George F. Luther, A.M.Inst.T., who, as recorded in our January 4 issue, has been appointed General Traffic Manager, British & Irish Railways Inc., New York, on and

Mr. L. J. Hamblin

Appointed Industrial Relations & Welfare Officer British Transport Commission

Mr. J. A. Owen

Appointed District Motive Power Superintendent, Accrington, L.M. Region

Mr. H. P. B. Betlem

Appointed General Agent for Switzerland, British Railways

from January 1, 1957, began his railway career as a junior clerk on the former L.N.W.R. at Leighton Buzzard in 1916. After gaining experience in the London, Chester, and Holyhead districts he transferred to the District Passenger Manager's excursion section at Euston in 1927. He was appointed Road Traffic Inspector, District Passenger Manager's Office, Euston, in 1932. Four years later he became Head of the District Passenger Manager's Office at Fenchurch Street, where he remained until early 1940, when he joined H.M. Forces. Mr. Luther was commissioned in the Royal Engineers and, in April, 1941, was taken prisoner while serving with the B.E.F. in Greece. Following demobilisation in 1945, he became Deputy Head of the Chief Commercial Manager's Excursion & Cheap Fares Section, and, in 1947, was appointed Passenger Assistant to the District Goods & Passenger Manager, Sheffield. He became Head of the Development Section (Passenger & Parcels), Commercial Superintendent's Office, Euston, in 1950, and, two years later, was appointed Assistant District Passenger Manager, Euston. In January, 1956, he was appointed District Passenger Manager, Birmingham, British Railways (L.M. & Western Regions), the position he now vacates.

Mr. F. T. Gray, who, as recorded in our December 21 issue, has been appointed Assistant Director of Costings, General Staff, British Transport Commission, began his railway career with the N.E.R. in 1922 in the office of the General Manager, York. He became a traffic apprentice in 1925 and underwent training until 1930. After nearly five years in the road motor section of the office of the Chief General Manager, L.N.E.R., he was appointed Assistant to the District Goods Manager, Leeds, and, later, Head of the General Section of the Passenger Manager's Department at York, a position he held until 1939. During the next two years Mr. Gray became Acting Assistant to District Goods Manager, Leeds; Head of Coaching Stock Section, Central Rolling Stock Control, York, and Acting Assistant to District Goods Manager, Hull. In 1943 he became Acting Cartage Manager, York, and a year later was confirmed in that position. In 1949 he was appointed Assistant to Commercial Superintendent (Cartage & Terminals), North Eastern Region, and, in 1950, Assistant to Commercial Superintendent (Freight). He was appointed Traffic Costing Officer, British Transport Commission, in 1951, redesignated Senior Traffic Costing Officer in 1953, and further redesignated Principal Traffic Costing Officer in July, 1956.

Mr. L. J. Hamblin, Assistant to Chief Operating Superintendent (Research), Paddington, Western Region, British Railways, who, as recorded in our January 4 issue, has been appointed Industrial Relations & Welfare Officer, British Transport Commission, began his career with the Great Western Railway at Highbridge (Somerset) in 1924 and transferred to the Divisional Superintendent's Office at Bristol in 1927, where he was engaged on staff matters. Early in 1929 he began a course of special training and, in 1934, after varied experience as stationmaster, moved to the office of the Superintendent of the Line at Paddington, where he was again engaged on staff matters. He was appointed Junior Assistant to the Divisional Superintendent at Birmingham in 1938 and later that year became Chief Clerk to the Divisional Superintendent at Worcester. In 1941 he became Assistant Divisional Superintendent at Cardiff, where he remained until 1942 when he transferred to Paddington in a similar position. Mr. Hamblin was appointed District Operating Superintendent, Worcester, in 1951, and later the same year became District Operating Superintendent at Chester. In 1954 he assumed responsibility for special duties at Paddington in connection with productivity and research, and in 1955 was appointed Assistant to the Chief Operating Superintendent. Western Region, the position which he now vacates. He is a Member of the Institute of Transport, and an Associate of the Institute of Railway Signal Engineers.

Mr. J. A. Owen, who, as recorded in our November 23 issue, has been appointed District Motive Power Superintendent, Accrington, London Midland Region, British Railways, was educated at the Xaverian College, Manchester, and commenced his railway career in the former Furness railway workshops at Barrow-in-Furness in 1928. He was later transferred to the Chief Mechanical Engineer's Locomotive Works, Derby, as a privileged apprentice, and subsequently gained supervisory experience in motive power depots at Camden, Crewe, and Bescot. He was appointed to take charge at Millhouses (Sheffield) in 1938, at Canklow in 1941, and at Staveley in 1943. In 1945 he became Divisional Office Inspector at Derby, and, in 1949, Assistant District Motive Power Superintendent at Toton. Mr. Owen was appointed Maintenance Assistant to the Divisional Motive Power Superintendent Derby in March, 1954, the position he now vacates.

Mr. H. P. B. Betlem, who, as recorded in our December 28 issue, has been appointed British Railways General Agent for Switzerland, at Basle, entered the service of the former Great Western Railway at Kensington (Addison Road) in 1929. Later in the same year he was transferred to the Chief Goods Manager's office and during the next twelve years obtained experience in various sections of that department, in the London and Worcester Districts, and in the staff sections of the General Manager's Office and the London District Goods Manager's Office. In April, 1946, he was appointed a member of the Secretariat of the Continental Traffic Committee at its inception, and accompanied a number of British railway delegations to meetings in London and abroad of the International Union of Railways. He has been Secretary of the Union's Special Committee for Exchange of Information from its first formal meeting in 1946. In 1949 he was appointed Assistant, Railway Research Service, British Transport Commission, which position he now vacates. Mr. Betlem served with the National Fire Service from 1941 to 1945, being attached for the last two years of that period to the corps of educational lecturers in the London area. He is a Graduate of the Institute of Transport and has delivered a number of papers dealing with transport subjects abroad.

Mr. R. E. Evans has been appointed District Engineer, Ipswich, Eastern Region, British Railways.

Mr. E. Steele, Stationmaster, Hardengreen (Midlothian), Scottish Region, British Railways, has been appointed Stationmaster, Paisley Gilmour Street.

The Metropolitan-Vickers Electrical Co. Ltd. announces that Mr. R. R. Whyte has been appointed Assistant Works Manager (Mechanical), in which capacity he will be responsible for the large and small turbine departments and the company's Germiston Works (Glasgow). Mr. A. Paterson's position as Assistant Works Manager, Trafford Park Works, remains unchanged.

Mr. W. C. F. Hessenberg has been elected a member of the council of the Iron & Steel Institute.

Mr. H. F. Tremlett has been appointed Deputy Director of the British Welding Research Association.

Mr. D. A. Bishop has been appointed Export Manager of F. E. Weatherill Limited.

Martonair Limited announces the appointment of Mr. John Kay, a member of the technical staff at the Company's head office, as representative for the West of England.

Mr. Eric Dennis has been appointed a director of Automotive Engineering Limited, a subsidiary of Sheepbridge Engineering Limited.

Mr. C. R. Corness has been appointed Secretary of Taylor Woodrow Construction Limited, a main subsidiary of the Taylor Woodrow Group, in succession to Mr. L. Daniels, who continues as Secretary of Taylor Woodrow Limited, the parent company. Mr. Leslie G. Cann has been appointed Deputy Chief Surveyor of Taylor Woodrow Construction Limited. The Chief Surveyor is Mr. R. G. Puttick.

Mr. Frank Banfield, Managing Director of the Expanded Metal Co. Ltd., leaves the U.K. early in March on a tour of the West Indies and South America.

Mr. W. H. Fazdean, Chairman & Managing Director of British Insulated Callender's Cables Limited, is on a world business tour during which he will visit Australia, New Zealand, the Far East and North America.

The Rt. Hon. R. R. Stokes, M.P. for Ipswich, Chairman & Managing director of Ransomes & Rapier Limited, and Managing Director of Cochran & Co. (Annan) Limited, leaves London next week on a short visit to Beirut and Baghdad.

Mr. J. Price, Sales Manager of Pollard Bearings Limited, is making an extended business tour of Canada and U.S.A. A new factory for making Pollard Bearings is scheduled to open near Toronto early this year. Mr. P. Fenton, Export Sales Manager, leaves on February 3 for a business tour of India, Pakistan, Australia, and South Africa. He will hold a series of conferences with industrial concerns interested in the company's products for existing and experimental machines.

Ing. Fritz Ehrensperger, Manager of Works, Soc. Suisse pour la Construction de Locomotives et de Machines, Winterthur, has retired after 52 years of service with that company. He has been succeeded by Ing. Gottfried Hirsbrunner. Mr. Paul Münger succeeds Mr. Hirsbrunner as Manager of Locomotive Shops & Ancillary Services.

Mr. Miles Beevor, Deputy Chairman & Joint Managing Director of the Brush Group Limited, has relinquished the position of Joint Managing Director. He remains as Deputy Chairman. Mr. Ian T. Morrow, Joint Managing Director, has been appointed Managing Director. Mr. Charles Barnard, hitherto Managing Director of Mirrlees, Bickerton & Day Limited, has been appointed to the board of the Brush Group with special responsibilities for the Group's heavy engine factories. Mr. M. C. Clear has also been appointed to the board of the Brush Group Limited, as Director in charge of Exports.

NEW EQUIPMENT AND PROCESSES

Machine Guard Safety Switch

FIRST developed for use on the manufacturer's own grinding mills, the A. & W. safety interlocking switch, applicable to heavy machine tools of the type to be found in railway workshops, offers more positive and more foolproof protection to operators than conventional safety devices intended to operate upon the removal of guards.

This precision made switch is stated to make it impossible to remove guards accidentally, intentionally, or even by tampering with the switch itself, while the machine is running. Similar in principle to a barrel and plunger lock, its operation depends upon the accurate individual and independent depression of precision-ground multiple plungers. It is impossible to operate it except by the correct sequence of operations.

The switch bolts on to the side of the machine and a separate beam key is permanently attached to the guard. This key locates in a vertical slot in the switch body where it rests on the plunger of a microswitch, and is held in position by a locking lever. Thus the key cannot be released or the guard moved without first operating the locking lever. Moving the lever stops the motor. Withdrawing the key even two or three thousandths of an inch then releases the microswitch plunger, preventing restarting. It can only be restarted by properly replacing the key (and therefore the guard) and then moving the locking lever into the lock position. Operating the locking lever alone will not restart the machine. The guard must be in place and the key resting on the microswitch.

Where magnetic brakes are used the A. & W. safety switch can be adapted so that not only is the motor circuit broken but the magnetic brake circuit is closed at the same time. The switch body is a machined die-casting and all working parts are of hardened and ground steel.

The price and delivery will be quoted on application. The manufacturer is Ault & Wiborg Limited, Standen Road, Southfields, London, S.W.18.

Voice-Controlled Loudspeaking Telephone

IMPROVED interdepartmental communication in railway headquarter offices or large stations, depots, or works is facilitated by a loudspeaking telephone for use with existing private automatic exchanges. Incorporating a voice-operated switching circuit which automatically controls reception and transmission, this switching circuit replaces the manually-operated talk/listen switch used in older-type loudspeaking telephone systems. It gives the user complete freedom of movement to take notes, consult files or move about while still speaking on the telephone. In loudspeaking telephone systems the voice-operated switching circuit or the manually-operated talk/listen switch prevents "howl" in the loudspeaker.

With the voice-operated system the differential switching of microphone and loudspeaker paths varies with the magnitude of the impressed voice signals. When a speech signal is connected to the amplifier, in either direction, the wanted through connection is made and the unwanted path is attenuated.

The loudspeaking telephone equipment consists of a desk-mounting cabinet, housing the loudspeaker and microphone, and an amplifier unit. The latter can be remote from the telephone. Any number of units may be installed on the same exchange system.

The conventional handset mounted on the side of the cabinet can be used to prevent incoming speech being overheard, the loudspeaker being automatically switched out of circuit when the handset is lifted from its rest. The user may also prevent a distant caller hearing a local conversation by operating a key to switch out the microphone. In addition to the usual automatic dialling, direct calling is provided to contact up to 20 extensions.

Prices may be obtained on application. The loudspeaking telephone equipment is marketed in Great Britain by the Reliance Telephone Co. Ltd., Parker Street, W.C.2.

Coal Additive to Reduce Smoke Corrosion

A FUEL additive to reduce corrosion from combustion products and to remove soot, which can be used in coal-burning locomotives and industrial plants is the SSR/112. It is a blended powder of metallic salts and organics synergised by various combustion catalysts, and can be stored in depots, without any particular precautions, being incapable of causing skin sores through handling.

The combined action of the powder inhibits the formation of sulphur trioxide, and thus its possible transformation into corrosive sulphuric acid, in the hot flue gases; allows almost total combustion of carbon particles; and lowers the ignition point and consequently the dew-point of the gases, allowing sticky, sooty deposits to disappear. Reduction in weight and acidic content of slag and ash deposits and their conversion to a fluffy state also takes place.

The powder must be correctly applied, in right proportion, by being blown into the firebox or combustion space; one of the suggested feeding methods is an air supply connected to the firebox, which acts through a suction jet unit, drawing the powder from a storage hopper into the air stream, the air supply being controlled by a needle valve.

Economies through increased heat transfer by the removal of sooty deposits and elimination of sulphate corrosion, increased combustion efficiencies, and prevention of smokebox corrosion are expected to result from the application.

Laboratory tests simulating working conditions have been carried out, and practical application of the method to actual plant is being tested, including, it is reported, trials with British Railways locomotives.

The price of SSR/112 is 2s. 6d. per lb., the average proportion being 1 lb. per ton of coal. Delivery is approximately three weeks at present. The manufacturers are Amber Industrial Chemical Treatments, 11A, Albemarle Street, W.1.

Lightweight Floor Sweeper

WORKSHOP floors or station platforms with reasonably smooth surfaces can be swept by the machine illustrated below. Designed to be light and manœuvrable enough for female labour, the standard

model sweeps 28 in. wide. In a workshop, it would be best used for sweeping long passageways and gangways.

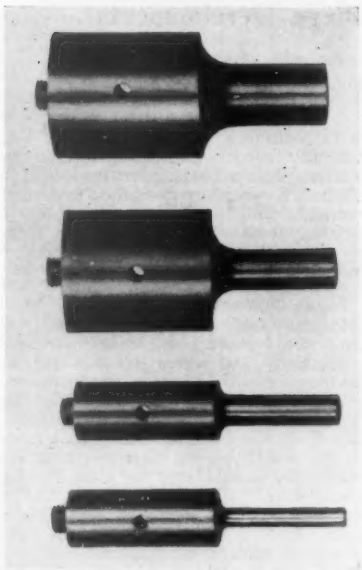
The chassis is of all-steel welded construction and the solid-rubber-tyred wheels are fitted with roller bearings. The brush, which is friction driven, is of double helical design which controls the dust problem, inherent in this type of machine, by acting as an air extractor. The brush is of union mixture bristles and the dust-box is of corrosion resisting light-alloy.

The sweeper can pick up all types of swarf, shavings, dust, and paper packets, and development tests have included picking up steel bar end off-cuts of up to one-in. dia.

The price of the machine is £32, and delivery can be made within 14 days. The manufacturer is Blackburn (Dumbarton) Limited, Castle Road, Dumbarton.

Increasing Capacity of Ultrasonic Drill

A SET of re-designed matching stubs for use with the Mullard 50-W. ultrasonic drill is now available. The drill is suitable for drilling hard and brittle materials, such as glass carriage window panels. The matching stubs have advantages over the exponential types hitherto



supplied for the drill. First, they give a greatly increased amplitude gain, and, therefore, considerable improvement in cutting speed; second, they allow use of much larger tools, thereby increasing the capacity of the drill. They are of stepped cylindrical construction, and give an amplitude gain equivalent to the square of the ratio of the end diameters. Exponential stubs give a gain equivalent only to the simple ratio of the end diameters. The set comprises four stubs, the sizes of which are $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$ and $\frac{3}{4}$-in. dia.

The price of the set of stubs is £4 and delivery can be made from stock. The manufacturer is Mullard Limited, Torrington Place, W.C.1.

Light Diesel Dumper

THE Muir-Hill 3-S. 1-cub. yd. capacity diesel dumper is useful where a relatively high speed and smaller capacity machine is required, as in some cases of earthwork, movement of ballast, and rubble clearance.

The 3-S. is powered by a 2-cyl., air-cooled, 12-b.h.p. Petter AVA2 engine, and drives, through a 10-in. single dry plate clutch, the constant mesh type gearbox to provide three forward and one reverse speeds. The final drive is through a hypoid drive axle of semi-floating type.

With a top speed of 18 m.p.h., the low centre of gravity, good weight distribution and ground clearance is said to give an impressive performance on unmade ground. Compensation for power surge and transmission shocks is provided by resilient mountings of the engine and gearbox assembly, whilst the body catch similarly is designed to remain safe with positive and light operation in all conditions. Girling 10-in. × 1¾-in. brakes are fitted, acting on the driving wheels, and can be operated by hand lever, enabling the machine to be inched forward for accurate load placing.

All driving controls are conveniently placed, and the exhaust system is positioned well away from the driver. Oilless bushes are fitted throughout. The 3-S. has a struck capacity of 19 cu. ft. The body lip height is 3 ft. 4 in., the height at the sides being 3 ft. 6 in.

The price and delivery position are not available at present. The manufacturer is E. Boydell & Co. Ltd., Old Trafford, Manchester, 16.

Copper Tubes

PROMPT delivery is offered for I.C.I solid drawn copper tubes suitable for pipework for locomotive components and carriage fittings, in 15-18 ft. random lengths, hard or soft temper.

Immediate delivery of tubes covering a range of 2½-8 in. bore and thicknesses of 4-14 s.w.g. is available, while a 48-hour service is quoted for sizes between ⅛ in. o.d. and 2½ in. bore with walls of 8-22 s.w.g.

In addition, extensive stocks of all standard sizes of copper building service tubes to B.S. 659 and B.S. 1386 are held. Enquiries should be made to the nearest sales office of Imperial Chemical Industries Limited, or to P.O. Box 216, Witton, Birmingham, 6.

B.R.S. and Road Haulage Developments

General Manager of B.R.S. on the future shape of activities and possibility of using railways for trunk haulage

In a paper read to the Tees-side and District Section of the Institute of Transport on January 18, Major-General G. N. Russell, General Manager & Chairman of the Board of Management of British Road Services, said that the subject uppermost in the minds of his audience, despite all sorts of upheavals great and small, was development of the road system in Britain. Although he proposed only to talk about the road system, he thought they must always bear in mind that this development was paralleled by a major development on the railways. It was important to ensure that these two developments did not move in water-tight compartments.

There had been a great reluctance to move from the nineteenth-century railway system to a twentieth-century road system, and Governments of all parties had ever lagged behind public opinion. Two world wars had reinforced this inability to think ahead, because the communications in this country and in many others were such that the roads were completely unable to carry the wartime load. The railways consequently stepped in with their large latent capacity and met the need to move enormous quantities of tonnages of heavy materials. It became a question of quantity rather than speed, and it was not realised that going back to this slow-motion movement, which suited a wartime economy, was a retrograde step when viewed against the background of modern technical developments in other fields.

Railway Efficiency

"The railways did a wonderful job," he continued, "but there was a tendency to overlook the fact that the efficiency and cost of movement were not satisfactory by modern standards. For instance, in war we can afford a long and heavy pipeline full of capital goods, but this is out of the question in the modern competitive world. . . . In this age there is a need to move goods quickly from place to place in order to avoid tying up capital unnecessarily and to save handling and packing. It is therefore necessary to have a modern and up-to-date road system, and not only a railway system which meets some but not all requirements."

There was a great need for main trunk motorways and for an easement in the congested streets of cities to allow vehicles which used the motorways either to bring their occupants to their business or to allow the freight carried to be taken to workshops, warehouses, docks, and so on.

Tribute to Minister

On the 20/30 m.p.h. speed limit for goods vehicles, he thought a great debt of gratitude was owed to Mr. Harold Watkinson, Minister of Transport & Civil Aviation for the way he had handled the subject. "We have been arguing about it for years and years, and every sort of little pettifogging difficulty has been put into people's way to stop any change being made." On May 1, if Parliament approved, heavy vehicles would be able to travel at 30 m.p.h., and it was up to them to see how they could take advantage of it.

The immediate effect was that it would be possible to do many journeys more quickly. The journeys most affected were in long-distance haulage, and these were generally journeys between main industrial centres. Not all such journeys would be affected, for in many cases they were made overnight, and there was no advantage in arriving at the destination sooner if the factory was not open at that time to receive the load.

Increased Productivity

In many cases the increase in the speed limit would make possible an increase in productivity, and where this was the case the men responsible for the greater productivity would have a fair share of the benefit. At present, wages were paid on a time basis, and whatever change took place, no-one would suggest that less than one hour's pay should ever be given for one hour's work. "But," he suggested, "as the increased productivity arising from a higher speed limit is measured in miles, why should a mileage element not be introduced into the wages calculation? After all, hauliers in effect sell 'ton-miles,' so why should they not 'buy' miles from their drivers instead of time? The idea is not so revolutionary—it is applied on the railways—and in any case it would in my view be a very good thing to introduce an incentive element into drivers' wages."

Large-Scale Operation

There was no question that large-scale operation could in many respects be more efficient than small-scale. Things could be bought more cheaply, the movement of lorries could be controlled and return loads obtained more easily. Lorries could be repaired more efficiently and economically, and advantage could be taken of the large organisation to conduct experiments and so on which were impossible for the small man. A large organisation had larger and more varied resources, and could command the services of experts and specialists. Large depots made it possible to introduce modern methods such as mechanical handling. Operational research could be conducted on a scale that would be impossible in an industry made up entirely of small units. Services could be put on a regular basis; networks of services could be established; and the requirements of large manufacturers and traders could be met with a haulage undertaking of comparable size.

The disadvantages included remoteness, "not knowing who your boss is, shakiness of communications, lack of clarity in instructions, and all those disabilities which are caused by the gap between the directing authority at the top and the driver upon whom the implementation of orders depends." These disabilities could be overcome and were being overcome in British Road Services.

Fuel Rationing

As to fuel rationing, he maintained that it was useless to be despondent about difficulties. Good nearly always came out of adversity. They were being forced under present circumstances to adopt many new practices. They must be carefully watched and recorded both as to experience gained and to costs of operation. Before they returned to old and well-tried practices they must be certain that some of the new ones enforced by fuel rationing were not worthy of more extended trials.

They had not yet built up any information about these changes, but as time went on they would get figures based on experience, and he suggested that in two fields in particular special notice of the situation created by restrictions of fuel should be taken.

Traffic by Rail

Was it a sound economic proposition to transfer long-distance traffic to rail on certain selected heavy routes? What effect had the clearing of cities of vehicle traffic had on commercial activities, more particularly on capacity to collect and deliver goods more efficiently? It would be clearly shown by at least the middle of February that the economic advantage of clear streets had been immense.

Railway Freight Charges

A number of letters has appeared in *The Times* recently, pointing out the high cost of rail movement of goods compared with that by road. The letters have given this reason for reluctance to consign goods by railway during the present motor fuel shortage.

In a letter published in *The Times* of January 21, Mr. J. H. Brebner, Public Relations Adviser, British Transport Commission, explains that although British Railways are endeavouring to the fullest extent to offer competitive rates, railway transport is pre-eminently suitable for the mass movement of goods and merchandise in full wagon- and full train-loads. Individual cases are bound to occur where it is more economical for comparatively small lots of traffic to be carried by road rather than by railway, although conversely there are many instances where the rail rate is cheaper.

"In some recent cases, mentioned by your correspondents," he continues, "it would appear that they were quoted the appropriate ordinary rate on the books, whereas it is usually possible for the railways to quote fully-competitive rates for traffic in truck-loads. In every case where a trader is contemplating diversion of traffic to rail, we suggest that the local goods agent or district commercial officer be fully consulted on all aspects of the trader's requirement, so that the most advantageous rates can be quoted according to the circumstances of the traffic."

Fully Automatic Transmission for Buses

The C.A.V. electrical fully automatic transmission control system has been developed by Associated Commercial Vehicles Limited from the Monocontrol electro-pneumatic transmission at present used on recently constructed buses for London Transport.

The automatic gear is readily adjustable to suit any particular route conditions, and over-riding control of the automatic gear-changing by the driver can be provided. This is of especial use in hilly districts. The gears are changed automatically according to the speed of the vehicle and the power required at any moment. Speed-sensitive and torque-sensitive elements send appropriate signals to the control unit or "brain" of the equipment which interprets them into upward or downward gear changes as necessary. The driver is relieved completely of any control of the transmission. A saving in fuel consump-

tion should be shown. All the driver has to do is to select by a small lever forward or reverse motion as desired, after which he operates the accelerator pedal to obtain any required speed. The mechanism further simplifies the movements the driver has to make by automatically returning the gear to neutral when the vehicle is brought to rest.

It is understood that a transmission system of this type is being planned for the initial batch of 850 Routemaster double-deck buses which are to be built by the A.C.V. group for London Transport. The final decision will be made later.

Restoration of Wotton Tramway Locomotive

One of the two original 0-4-0 flywheel locomotives used on the Quainton Road to Brill branch of the former Metropolitan Railway was presented to the British Transport Commission at a ceremony on January 19 at the Neasden Depot of London Transport; it will be added to the Commission's collection of historic locomotives.

Mr. A. W. Manser, Chief Mechanical Engineer (Railways), London Transport Executive, accepted the locomotive on behalf of the B.T.C. from Mr. G. Alliez, Chairman of the Industrial Locomotive Society. Mr. Alliez outlined the story of the locomotive's preservation since negotiations for its purchase in 1950 by the I.L.S. were begun. By gaining the interest of the late Mr. W. S. Graff-Baker, formerly Chief Mechanical Engineer (Railways), London Transport, its survival had been made possible. Among the guests at the ceremony were London Transport craftsmen who have recently carried out restoration work on the engine.

The locomotive, built by Aveling & Porter, of Rochester, in 1872, was in service with its counterpart, No. 806 on the Brill line, then known as the Wotton Tramway, until 1894, when the two engines were sold to the Nether Heyford Brickworks, Northants. The one now restored was used as a shunting locomotive until 1940, when the brickyard was closed.

The Wotton Tramway, 6½ miles long, was completed in 1872.

Reconstructed Deep Water Wharf at Mombasa

In 1954 a landslide destroyed a considerable part of the wharf forming No. 10 deep-water berth at Kilindini Harbour, Mombasa, East African Railways & Harbours; its reconstruction now in hand is expected to be completed by the end of this year.

The new substructure consists of 230 42-in. dia. cylinders, more than half of which are now in position. They are being sunk to depths down to 100 ft. below low water at spring tides, and extend from the shore in nine two-cylinder bents.

Spanning between them are no fewer than 700 pre-stressed post-tensioned decking beams, each weighing over 20 tons and measuring 62 ft. long, 4 ft. 3 in. in depth and having flange and web widths of 2 ft. 1 in. and 5 in. respectively. Tension bars are 1-in. high-tensile steel, the designed extension of which when drawn by hydraulic jack is about 3 in., and the beam develops a strength of some 5,000 lb. per sq. in. after five days. These beams were cast on the site and carry concrete slab decking. The coping level is 33 ft. above low water level.

To protect the wharf from future similar damage, a 950-ft. sheet-pile wall is being driven behind berths Nos. 9 and 10 to depths of between 40 ft. and 65 ft.

Staff & Labour Matters

N.U.R. Wage Claim

The claim of the N.U.R. for an increase of 10 per cent in the rates of pay of railway salaried and conciliation staff was considered at a meeting of the Railway Staff National Council on January 18.

A further meeting of the Council was held on January 24.

Railway Shopmen

A meeting of the Railway Shopmen's National Council will take place on January 29 to consider the claim of the employees' side of the Council for an increase in the rates of pay of Workshop staff employed on British Railways.

Contracts and Tenders

The British Transport Commission has placed a contract with the Drewry Car Company, London, for 21 sets of engine transmission and control equipment for 21 200-h.p. diesel-mechanical shunting locomotives to be built in British Railways workshops at Swindon.

Contracts have also been placed with the Gloucester Railway Carriage & Wagon Co. Ltd., Gloucester, for 41 centre gangway second class brake coaches.

A contract has been awarded by East African Railways & Harbours to the combined firms of Kier, Christiani & Nielson for the construction of four wharf walls and reclamation for new deep-water berths on the Mombasa mainland at Kipevu. The value of the contract is some £1,900,000. J. L. Kier & Company has recently completed the construction of three deep-water berths in Dar es Salaam and Christiani & Nielsen between 1941 and 1943 built deep-water berths at Mombasa for the Kenya and Uganda Railways & Harbours Administration. The work will be completed within 27 months from the date the contractors have access to the site.

The British Transport Commission announces the placing of a contract with Mitchell Engineering Limited for the supply and erection of two appliances for the shipment of coal at Immingham Dock. The new appliances will be provided with rotary side tipplers, conveyor belts, and hinged radial conveyors.

British Railways, London Midland Region, have placed the following contracts:—

William Mason & Son Ltd., 128-132, Baker Street, W.1: renovations and improvements, overseas freight office, Leadenhall Street, London

Samuel Butler & Co. Ltd., Albion Works, Stanningley, nr. Leeds: erection of steelwork low level awnings, Citadel station, Carlisle

A. E. Knights, "Woodthorpe," Rowton Grange Road, Chapel-en-le-Frith, nr. Stockport: permanent way maintenance work, Derby North District 1957

Leonard Fairclough Limited, Gordon House Road, London, N.W.5, and Caffin & Co. Ltd., 25, Craven Street, Strand, W.C.2: permanent way maintenance work, Western & Midland Divisions, London District 1956-1957

Butterley Co. Ltd., Butterley, nr. Derby, and John Gill Contracts Limited, 123, Pall Mall, London, S.W.1: repairs to spans 26 and 27, bridge No. 288, Great Central Line over Nottingham Midland station

A. E. Farr Limited, Station Road, Westbury, Wilts: reconstruction of superstructure, bridge No. 36, Grand Junction line

William Huddleston & Sons Ltd., Back Sefton Road, Morecambe, Lancs: accommodation and stores for carriage cleaners at Euston Road, Morecambe

Mechanised Contractors (London) Limited, 25-27, Central Chambers, Ealing Broadway, London, W.5: formation renewal and drainage 129 m. 1,405 yd. to 130 m. 178 yd. Braunston and Willoughby-Charwelton

E. B. Jones & Rawlinson Limited, Leaf Square, Salford 6: wages staff canteen, Fairfield Street goods depot, London Road, Manchester

L. Fairclough Limited, Chapel Street, Adlington, Lancs: formation renewal and drainage 31 m. 1,591 yd. to 32 m. 231 yd. Whalley-Clitheroe.

British Railways, North Eastern Region, have placed the following contracts: —

Keith Blackman Limited, Leeds: sawdust extraction plant, York wagon works

Denhams Engineering Co. Ltd., Halifax: crankpin re-turning lathe, Darlington loco. works

L. C. Abdale & Son, Darlington: proposed pump house, Middlesbrough

Iredale Bros. Ltd., Brighouse: external repairs, 3 & 5, Canal Road, Bradford

J. W. Roberts Limited, Leeds: supply and spraying with "Limpet" asbestos 37 second class sleeping cars

British Railways, Scottish Region, have placed the following contracts:—

T. Boland & Co. Ltd., Edinburgh: new staff accommodation, Yoker High marshalling yard

The Clyde Structural Iron Co. Ltd., Glasgow: provision of new wagon repair shed, replacement of goods shed by umbrella type roof, General Terminus Station, Glasgow

A. & J. Faill Limited, Glasgow: reconstruction of roadways, Thurso goods station

D. Wickham & Co. Ltd., Ware, Herts: provision of rail motor trolleys, Inverness district.

The Railway Board, Government of India, proposes to buy locomotives, rolling stock, and other equipment for its 1957-58 rolling stock programme. See Official Notices on page 120.

Tenders are invited by New Zealand Railways for the supply of 18 diesel-electric shunting locomotives of 400-500 h.p. to operate on 3-ft. 6-in. gauge track. Copies of specifications and drawings are available at £10 per set (not refundable) from the High Commissioner for New Zealand, 415, Strand, London, W.C.2 (Ref. C/F.99/1592). The closing date, at the office of the Comptroller of Stores, New Zealand Railways, Private Bay, Wellington, C.1, New Zealand, is March 27 at 4 p.m.

The Director-General of Supplies and Disposals, New Delhi, invites tenders for brake blocks and brake shoe clips as follows:—

40,000 ref. No. EB 1-102-2, blocks, brake, cast-iron for B.G. carriages and wagons, IRS Drg. No. W-900 alt. 5 and I.S. spec. No. IS-210 grade 10C

70,400 ref. No. EB1-1055, block, brake, cast-iron for M.G. carriages and wagons, IRS Drg. No. W-901 alt. 6 and IS spec. No. IS-210 grade 10C

60,400 ref. No. EB1-135-1, clips, brake shoe (steel, class II) for motor and trailer bogies of E.M.U. stock. W. Rly's C.S.R. Drg. No. 1099 alt. 3 (DGS & D No. 8219) and IRS spec. No. M5/54

Delivery of half the quantity is required by August, 1957, and the remainder by December 1, 1957, and tenderers should give the earliest monthly schedule of deliveries that they guarantee to adhere, showing a definite date from which deliveries will be commenced. Tenders should be addressed to the Director-General, Supplies & Disposals (Section SRI), Shahjahan Road, New Delhi, quoting reference No. P/SRI/17543-G/II. The closing date is January 29, 1957. Forms of tender are only available for purchase in India from: (1) Deputy Director-General (Supplies), Directorate General of Supplies & Disposals, New Delhi; (2) Director of Supplies & Disposals, Bombay or Calcutta; (3) Deputy-Director of Supplies & Disposals, Madras. If the date for the receipt of tenders does not allow sufficient time for tenderers to obtain tender forms from India, they may submit their quotation to India in their own letter form or by telegram provided always that all essential particulars are given and further provided they simultaneously apply for the tender forms and return them duly completed as soon as possible on the basis of advance quotations already submitted. A copy of the tender form can be examined at the India Store Department, Government Building, Bromyard Avenue, Acton, London, W.3, on application to the "CDN" Branch quoting reference No. S.2553/56/Rly./BN, and the drawing can be seen at the office of Hodges Bennett & Company, 59/60, Petty France, Westminster, London, S.W.1, from whom copies may be obtained, if required, at a fixed price per sheet.

The Special Register Information Service, Export Services Branch, Board of Trade, reports a call from India for 266 items of upper quadrant double wire signal mechanism.

The issuing authority is the Director General of Supplies and Disposals. The tender No. is SRIA/18719-G/V (c.). Bids should be sent to the Director General of Supplies and Disposals, Shahjahan Road, New Delhi. The closing date is January 31, 1957.

A set of tender documents but not specifications and drawings is available for loan to United Kingdom firms on application to the Branch (Lacon House, Theobalds Road, W.C.1). A photo-copy set can be purchased from the Branch for 16s. Cheques and postal orders should be made payable to the Principal Accountant, Board of Trade. Firms wishing to collect photo-copy sets of tender documents are advised to notify the Branch in advance of their requirements. Local representation is essential. The reference No. ESB 799/57 should be quoted in any correspondence with the Branch.

The Special Register Information Service, Export Services Branch, Board of Trade, has received a call from India for a large quantity of detector units, in two parts.

The closing dates are, (*a*) February 7, 1957; (*b*) February 6, 1957.

Details of the requirements can be obtained from the Branch (Lacon House, Theobalds Road, W.C.1) quoting reference No. (*a*) E.S.B./1312/57, (*b*) E.S.B./1314/57.

Sets of tender documents are available for loan to United Kingdom firms on application to the Branch. Photo-copy sets can be purchased from the Branch for (*a*) 17s., (*b*) 18s. Cheques and postal orders should be made payable to the Principal Accountant, Board of Trade. Firms wishing to collect photo-copy sets of tender documents are advised to notify the Branch in advance of their requirements. Local representation is essential.

The Special Register Information Service, Export Services Branch, Board of Trade, has received a call from Pakistan for chains, cylinders, piston rods, and hose pipe as follows :—

13,500 ft. chains M.S. galvd. for alarm signal, IRS. drg. No. C/701 alt. 3 & PRSS. R. 30-49 (EVB/62)

17 cylinder vacuum 15 in. F type without piston rod PC, RC & YB engine IRS. drg. No. VB-A9 alt.-6 (EVB/106/C)

135 rods M.S. piston brass covered 18-in. cylinder PS & RS. IRS. drg. No. VB-54. (EVB/283/C/2)

2,104 hose pipe IR 24 ft. × ¾ in. × ¾ in. IRS drg. No. VB-506 & PRSS-R-3-49. (EVB169J)

The issuing authority is the Department of Supply and Development, Government of Pakistan. The tender No. is DS/H/4121/P-4. Bids should be sent to the Director General of Supply and Development, Chittagong. The closing date is February 4, 1957.

A copy of the tender documents but not drawings is available for loan to United Kingdom firms on application to the Branch (Lacon House, Theobalds Road, W.C.1). A photo-copy set can be purchased from the Branch for 7s. Cheques and postal orders should be made payable to the Principal Accountant, Board of Trade. Firms wishing to collect photo-copy sets of tender documents are advised to notify the Branch in advance of their requirements. Local representation is essential. The Branch will, on request, supply a list of the local concerns who have expressed their willingness to act on behalf of United Kingdom firms. The reference number E.S.B. 1373/57 should be quoted in any correspondence with the Branch.

The Special Register Information Service, Export Services Branch, Board of Trade, has received a call from India for compensator and detector units as follows :—

(*a*) 1 D.W. compensator type "A" (single) 56-in. stroke for points and signals-transmission up to 800 yd., fitted with jockey weight to S.7314. (ADV) alt. nil to IRS drg. No. SA. 7303 (ADV) alt. nil., complete with alt. parts as listed on the drg. and to IRS. specn. S.15/53 & S-10/56. (TEN/23651)

(*b*) 800 detector unit layout with the following components generally on the line of IRS. drg. No. SA-5800, with rivets and bolts; detector, one set to IRS. drg. No. SA-5797 alt. nil, S-5798 alt. nil & S-5799 (adv.) alt. nil. & SA-5806 alt. 1. angle slide, two Nos. to IRS. drg. No. S-5818 alt. 2. shoe complete, one set to IRS. drg. No. SA-5817 alt. 3; S-5817 alt. 3; S-5814 alt. 2. point slides, two sets to IRS. drg. Nos. SA-3121 alt. nil; S-3624 alt. 1 & S-3124 alt. nil. to IRS. specn. No. S-10/56 (TEN/23652)

The issuing authority is the Director General of Supplies and Disposals. The tender Nos. are, items (*a*) SRIA/18708-G/V(D), item (*b*) SRIA/20275-G/V(B). Bids should be sent to the Director General of Supplies and Disposals, Shahjahan Road, New Delhi. The closing dates are (*a*) February 6, 1957, (*b*) February 5, 1957.

Sets of tender documents are available for loan to United Kingdom firms on application to the Branch (Lacon House, Theobalds Road, W.C.1). Photo-copy sets can be purchased from the Branch for 16s. Cheques and postal orders should be made payable to the Principal Accountant, Board of Trade. Firms wishing to collect photo-copy sets of tender documents are advised to notify the Branch in advance of their requirements. Local representation is essential. The reference Nos. (*a*) ESB/922/57, (*b*) ESB/924/57 should be quoted in any correspondence with the Branch.

The Special Register Information Service, Export Services Branch, Board of Trade, has received a call from India for injectors as follows :—

20 injector RCW type 9m/m for BESA & IRS classes to makers No. 12774 Gresham catalogue (EA1/IRA-23(SSB)

17 injector RCW type 10m/m for IRS & BESA classes to makers No. 12775 Gresham catalogue (EA1/IR/58/IRA-24)

The issuing authority is the Director General of Supplies & Disposals. The tender No. is R/SW2/19581-G/II. Bids should be sent to the Director General of Supplies & Disposals, Shahjahan Road, New Delhi. The closing date is February 5, 1957.

A set of tender documents is available for loan to United Kingdom firms on application to the Branch (Lacon House, Theobalds Road, W.C.1). A photo-copy set can be purchased from the Branch for 12s. Cheques and postal orders should be made payable to the Principal Accountant, Board of Trade. Firms wishing to collect photo-copy sets of tender documents are advised to notify the Branch in advance of their requirements. Local representation is essential. The reference No. ESB/1116/57 should be quoted in any correspondence with the Branch.

The Director General of Supplies and Disposals, New Delhi, invites tenders for strainers as follows :—

32 strainer complete, Tender WP. class as per R.P.&T. drg. No. E/ST-176/39 & 40 (D.G.S. & D. No. 13258 & 13259 Item A to A & respectively./S finish as per drawing

Delivery is required as early as possible. Tenderers should give the earliest monthly schedule of deliveries that they guarantee to adhere, showing a definite date from which deliveries will be commenced. Bids should be sent to the Director General, Supplies & Disposals (Section SRI), Shahjahan Road, New Delhi, quoting reference No. P/SRI/16771-G/II. The closing date is February 12, 1957.

Forms of tender are only available for purchase in India from: Deputy Director General (Supplies), Directorate General of Supplies & Disposals, New Delhi; Director of Supplies & Disposals, Bombay or Calcutta; Deputy Director of Supplies & Disposals, Madras. If the date for the receipt of tenders does not allow sufficient

time for tenderers to obtain tender forms from India, they may submit their quotation to India in their own letter form or by telegram provided always that all essential particulars are given and further provided they simultaneously apply for the tender forms and return them duly completed as soon as possible on the basis of advance quotations already submitted.

A copy of the tender form can be examined at the India Store Department, Government Building, Bromyard Avenue, Acton, London, W.3, on application to the "CDN" Branch quoting reference No. S.2695/56/Rly./BN. and the drawing can be seen at the office of Hodges Bennett & Company, 59/60, Petty France, Westminster, London, S.W.1, from whom copies may be obtained, if required, at a fixed price per sheet.

The Special Register Information Service, Export Services Branch, Board of Trade, reports a call from India for signal and point equipment as follows:—

166 double wire compensator type "C" (coupled) -92 in. stroke for transmission up to 1,500 yd. to IRS. drg. No. SA-7302 (advance) alt. nil. complete with all parts listed on the drawing including jockey weight to IRS specification No. S-15/53 and S-10/56

58 U.Q.D.W. signal mechanism 45 deg.-0 deg.-45 deg. to S&F IC 5720/2 or similar

80 single wheel rotary detector DWS to IRS drg. No. SA-8500 (advance) alt. one complete with all parts listed on the assembly drgs. and to IRS specification No. S10-56

200 D.W. rotary detector (double wheel) to IRS drg. No. SA-7504 (advance) alt. nil complete with all parts listed on the drg. and to IRS specification No. S10-56

40 key lock facing points (H.P. type) single complete with key lock "E" type with key and split stretcher bar B.G. for 90 lb. RBS rail section (ward Nos. to be specified afterwards) to drg. No. IRS (S)SA 3148 (advance) alt. nil complete with all parts as listed on the drg. and to IRS specn. No. S-10/56

258 "E" type lever locks for (advanced starters homes) (ward Nos. to be specified afterwards) to IRS SA 3376 (advance) alt. nil complete with all the parts as listed on the drg. and to IRS specn. No. S-10/56

6 key lock facing points (H.P. type) double complete with key locks "E" type with keys and split stretcher bar B.G. for 90 lb. RBS. rail section (ward Nos. will be specified afterwards) to drg. No. IRS(S) 3149 (advance) alt. nil complete with all parts as listed in the drg. and to IRS specn. No. S-10/56

270 T2 lever lock and nine-way circuit controllers complete for D.W. frames to S&F IC 5589/1 or similar

The issuing authority is the Director General of Supplies and Disposals. The tender No. is SR1A/18719-G(V)B. Bids should be sent to the Director General of Supplies and Disposals, Shahjahan Road, New Delhi. The closing date is February 6, 1957.

A set of tender documents is available for loan to United Kingdom firms on application to the Branch (Lacon House, Theobalds Road, W.C.1). A photo-copy set can be purchased from the Branch for 17s. Cheques and postal orders should be made payable to the Principal Accountant, Board of Trade. Firms wishing to collect photo-copy sets of tender documents are advised to notify the Branch in advance of their requirements. Local representation is essential. The reference No. ESB 654/57 should be quoted in any correspondence with the Branch.

The Director General of Supplies and Disposals, New Delhi, invites tenders for draught cast steel knees as follows:—

58 knee, draught cast steel without hole to CME's drg. No. 8456-A (I.S.D. No. 1069-D) Item 1 for NG carriage and to I.R.S. specn. No. M2/48, class "A" Gr-2. card No. 41/15/0031 machining allowance to be kept over 1 ft. 4 in. dimensions rest as per drg.

Delivery is required as early as possible. Tenderers should give the earliest monthly schedule of deliveries that they guarantee to adhere, showing definite date from which deliveries will be commenced. Tenders should be addressed to the Director General of Supplies & Disposals (Section SRI), Shahjahan Road, New Delhi, quoting reference No. P/SRI/16750-G/11. The closing date is February 5, 1957.

Forms of tender are only available for purchase in India from: Deputy Director General (Supplies), Directorate General of Supplies & Disposals, New Delhi; Director of Supplies & Disposals, Bombay or Calcutta; Deputy Director of Supplies & Disposals, Madras. If the date for the receipt of tenders does not allow sufficient time for tenderers to obtain tender forms from India, they may submit their quotation to India in their own letter form or by telegram provided always that all essential particulars are given and further provided they simultaneously apply for the tender forms and return them duly completed as soon as possible on the basis of advance quotations already submitted. A copy of the tender form can be examined at the India Store Department, Government Building, Bromyard Avenue, Acton, London, W.3, on application to the "CDN" Branch quoting reference No. S.2672/56/Rly/BN. and the drawing can be seen at the office of Hodges Bennett & Company, 59/60, Petty France, Westminster, London, S.W.1, from whom copies may be obtained, if required, at a fixed price per sheet.

The Director General of Supplies and Disposals, New Delhi, invites tenders for axle guards as follows:—

45 axle guards (old design box type), steel class II for wagons, without bolts and bottom cover. To MSM Rly. drg. No. 13924/IC Fig. 5 (DGS & D. No. 5055/1) W.Mod. & I.R.S.S. No. R-6/48. (EBI/62/BG.)

Immediate delivery is required. Tenderers should give the earliest date of delivery that they guarantee to adhere. Tenders should be addressed to the Director General, Supplies & Disposals (Section SRI), Shahjahan Road, New Delhi, quoting reference No. P/SRI/16217-E/I/RP. The closing date is February 5, 1957.

Forms of tender are only available fot purchase in India from: Deputy Director General (Supplies), Directorate General of Supplies & Disposals, New Delhi; Director of Supplies & Disposals, Bombay or Calcutta; Deputy Director of Supplies & Disposals, Madras. If the date for the receipt of tenders does not allow sufficient time for tenderers to obtain tender forms from India, they may submit their quotation to India in their own letter form or by telegram provided always that all essential particulars are given and further provided they simultaneously apply for the tender forms and return them duly completed as soon as possible on the basis of advance quotations already submitted.

A copy of the tender form can be examined at the India Store Department, Government Building, Bromyard Avenue, Acton, London, W.3, on application to the "CDN" Branch quoting reference No. S.2696/56/Rly./BN. and the drawing can be seen at the office of Hodges Bennett & Company, 59/60, Petty France, Westminster, London, S.W.1, from whom copies may be obtained, if required, at a fixed price per sheet.

The Special Register Information Service, Export Services Branch, Board of Trade, has received a call from India for Buda type ramps as follows:—

300 Buda type ramps, re-railing C.S. outside to drg. No. 3 V.69 (D.G. S. & D. No. 13261) to I.R.S. specn. No. M.2/48 class A, grade I

300 Buda type ramps, re-railing C.S. inside to N.E.R. drg. No. 3-V-69 (D.G.S. & D. No. 13261) to I.R.S. specn. No. M.2/48 class A, grade I

The issuing authority is the Director-General of Supplies and Disposals. The tender No. is SR2/18857/G/II. Bids should be sent to the Director-General of Supplies and Disposals, Shahjahan Road, New Delhi. The closing date is March 1, 1957.

A set of tender documents is available for loan to United Kingdom firms on application to the Branch (Lacon House, Theobalds Road, W.C.1). A photo-copy set can be purchased from the Branch for 12s. Cheques and postal orders should be made payable to the Principal Accountant, Board of Trade. Firms wishing to collect photo-copy sets of tender documents are advised to notify the Branch in advance of their requirements. Local representation is essential. The reference ESB/1644/57 should be quoted in any correspondence with the Branch.

The Special Register Information Service, Export Services Branch, Board of Trade, has received a call from India for lattice type signal posts as follows:—

37 signal post, lattice type, 25 ft. ABL, complete with ladder

62 signal post, lattice type, 30 ft. ABL, complete with ladder

37 two doll bracket (signal), complete with lattice main post and dolls 5 ft. 8¼ in. and 8 ft. 8¼ in. with ladders complete and dolls

The issuing authority is the Director-General of Supplies and Disposals. The tender No. is SRIA/18464-G/V(c). Bids should be sent to the Director-General of Supplies and Disposals, Shahjahan Road, New Delhi. The closing date is February 20, 1957. A set of tender documents is available for loan to United Kingdom firms on application to the Branch (Lacon House, Theobalds Road, W.C.1). Local representation is essential. The reference ESB 1642/57 should be quoted in any correspondence with the Branch.

The Special Register Information Service, Export Services Branch, Board of Trade, has received a call from Thailand for a large quantity of railway points and crossings.

The closing date is March 28, 1957. Tender forms together with specifications and drawings are available at the price of Baht 200.00 per set.

Details of the requirements can be obtained from the Branch (Lacon House, Theobalds Road, W.C.1) quoting reference E.S.B./1259/57.

Notes and News

Mechanical Engineer Required.—A British railway in Central Africa requires a district mechanical engineer, between 28 and 40 years of age. See Official Notices on page 120.

Vacancy for Engineer.—A large manufacturing firm in the Midlands requires an engineer to assist in the development and design of high power rectifier equipments. See Official Notices on page 120.

Vacancies for Manufacturers' Representatives.—Well established manufacturers' representatives in London have vacancies for further British representatives to augment existing British and Continental connections. See Official Notices on page 120.

Vacancies on Nigerian Railway Corporation.—The Nigerian Railway Corporation invites applications for the following posts :—Assistant works manager (locomotive); assistant works manager (carriage and wagon), and chief mechanical draughtsman. See Official Notices on page 120.

Integration of Two Institutes.—As from April 1 next, the British Institute of Management and the Institute of Industrial Administration plan to work as one body. A working plan for the complete integration of the two institutes devoted to the improvement of management practice in Britain is outlined in a letter circulated to members of the two Institutes.

Underground Proposed for Caracas.—An article contributed to the *Board of Trade Journal* for January 19 by the Commercial Department of the British Embassy at Caracas suggests that there are excellent specialised engineering opportunities in Venezuela for such works as tunnels and bridges. The article also mentions the possibility of an underground railway being constructed in Caracas.

Electric Locomotives for Chile.—The Government of Chile has decided to postpone a decision on tenders for the State Railway electrification scheme, mentioned on page 89 of our issue of January 18, for three months. A report from Santiago states that the Government is awaiting clarification of the country's financial situation. The dollar loan requested from the International Bank to finance the electrification has not so far been granted.

Jewels as Lost Property.—Jewelry valued at more than £15,000, left in a train on January 16 by the owner, was returned to her the next day after it had been handed in to the railway authorities by a friend who travelled in the same carriage. The passenger left the train at Weybridge. When she missed the jewel case she returned to the station and made inquiries without success. A reward was offered. The Southern Region of British Railways stated later that she collected the jewelry from the parcels office at Walton-on-Thames. The parcel bore her name and address and had been handed in at Farnham. Railway officials had no idea of the contents.

New Ship for Stranraer-Larne Service.—The Scottish Area Board announces that the British Transport Commission has approved provision of a new passenger and vehicle carrying vessel for the Stranraer-Larne route, and that a contract will be placed as soon as possible. The new ship will provide an all-the-year round service for the increasing traffic in road vehicles. Particulars of the design will be announced when the order is placed.

Assistant Engineers Required.—Applications are invited for posts of assistant engineers required by the Gold Coast Railway, to take responsibility for maintenance of track, bridges, buildings and other engineering works on section of railways. See Official Notices on page 120.

Report on Indian Bridge Collapse.—A commission of inquiry into the accident to the Madras-Tuticorin express at Ariyalur last November, when 150 persons were killed, is reported to have blamed the district engineer, the patrolman on duty, a stationmaster, and a permanent way inspector and his assistant for failing to discharge their duties properly. An approach to a bridge collapsed under pressure from unprecedented floods. The Government of India has announced that it has accepted the findings and will take such action as may be necessary.

Good Start for Plan to Speed Exports.—Traders in the Manchester area sending small consignments overseas have been quick to take advantage of the new British Railways scheme for fast factory to ship conveyance introduced at Manchester Liverpool Road depot on January 7. In the first week the depot dealt with nearly 1,000 consignments. The scheme provides for rail collection of small parcels for export by a special cartage service and amalgamation into wagonloads to shipside or docks at Liverpool and Birkenhead.

Rail Lubrication Featured in Film.—A 420-ft. 16-mm. film, "Carefree Curves," presented by the P. & M. Co. (England) Ltd. in association with Caltex was shown at a cocktail party at the Savoy Hotel, London, on January 18. The guests, who included the London representatives of railways in the British Commonwealth, on the Continent of Europe and in other countries overseas, and civil engineer officers of British Railways and London Transport and of Caltex (U.K.) Limited and the Agent Oil Co. Ltd., besides overseas representatives of the P. & M. Co. (England) Ltd., were received by Mr. E. A. Robinson, Chairman of the company, supported by Mr. W. A. H. Watts, Managing Director; Mr. D. Dudley Morgan, Director; Miss D. M. Burt, Director & Secretary; and Mr. J. A. Hill, Technical Assistant. The film was devised and commentary written by the P. & M. Company and produced by Dr. H. G. Casparius of Independent Cine Art in conjunction with Unicorn Head Visual Aids Limited. Various points were brought out in the film, such as the effects of curve wear on rails and wheel flanges (this was supported by diagrams showing wastage of metal which results); the way in which this wear can be reduced by use of P. & M. lubricators; the importance of using the correct type of grease; simplicity of maintenance; manufacture and testing of lubricators; special model lubricators for check rails; and the reduction of wear, reduction of tractive effort, and smoothness of running resulting from use of P. & M. lubricators. The film may be obtained on loan, on application to the P. & M. Co. (England) Ltd., 1a, Grosvenor Gardens, London, S.W.1.

Scottish Region Football Specials.—The Scottish Region of British Railways is making a special effort to meet the expected exceptional demand for rail transport to Edinburgh on February 2, and 78 special trains are being provided for supporters travelling to the Rugby International and the Hearts-Rangers and Hibs-Aberdeen cupties, including 30 special trains from Wales. There will be 17 special trains from Glasgow and its neighbourhood to Edinburgh in addition to the ordinary train services between the two cities. British Railways advise intending passengers to book in advance. To cater for the transport of crowds in Edinburgh and district, six trains will depart from Leith North station and five from Princes Street station for Murrayfield.

Radio-Telephony at Feltham Marshalling Yard.—In the article on page 20 of our January 4 issue it was stated that during foggy or inclement weather use has been made at Feltham Marshalling Yard, Southern Region, of Klaxon horns to indicate to drivers of shunting engines the movements to be made, but that with the introduction of diesel locomotives for humping, it was found that drivers were unable to hear the horns, so that humping operations were slowed down; it was therefore decided to install short-range radio-telephony. The Southern Region points out that without the slightest doubt a more powerful type of Klaxon horn could have been installed at Feltham which would have been audible to drivers of the diesel locomotives, but this could not have been accomplished without causing considerable nuisance to local residents.

Amenities Block at Llandudno Junction.—An amenities block for the use of staff at Llandudno Junction, London Midland Region, was opened on January 18 by Mrs. R. F. Summers, who was accompanied by Mr. Summers, Member, London Midland Area Board. The accommodation consists of three single-storey blocks linked by covered ways and pathways forming an unhindered circulation area on all sides. These buildings are used as workshops and stores. There is also a double-storey building with lavatories, cloak room, and drying room on the ground floor and a messroom on the first floor, these facilities being communal for all departments using the building. A projecting side wing houses the foreman's office and the time office and provides a view of the area under the foreman's control. Load bearing brick walls are employed, with concrete floors and flat roof to single-storey buildings and slated and boarded roof to the double-storey area. Throughout the double-storey block buff quarry tiles cover all floors except for the staircase which is carried out in mottled terrazzo. Light paint in various colours is used for decoration.

Whitehouse Industries Limited New Office.—Whitehouse Industries Limited has announced the opening of new and enlarged offices for the firm's Philidas division at 44, Hertford Street, London, W.1, tel. Gro. 1402-3. Besides the standard range of Philidas lock-nuts for the engineering and aircraft industries, the range of products is to include parts to AGS specifications, details of which will be included in the new catalogue.

Glyn, Mills & Company Results.—The report for the year ended December 31, 1956, of Glyn, Mills & Company shows that the profit for the year, after providing for taxation and making a transfer to reserve for contingencies, out of which account provisions have been made for

bad and doubtful debts, fluctuations in the value of investments, and other contingencies, was £168,136. To this is added £115,890 brought forward from 1955. The total of £284,026 compares with £276,290 for 1955. For the interim dividend of 8 per cent paid on July 31, 1956, £96,000 was appropriated and a similar sum is required for the final dividend of 8 per cent. An additional transfer to reserve for contingencies of £50,000 is made, as in 1955. There is a balance to be carried forward of £123,626 (£115,890).

Railway Overhead Contact Lines.—Some calculations and diagrams essential to full comprehension of the views advanced were omitted in error, for which we apologise to the author, from the article by Mr. Matthias Wittgenstein in last week's issue. It is hoped to reproduce these shortly, with further observations.

Dean & Dawson Limited New Poole Office.—A new branch office of Dean & Dawson Limited is to open in Poole on February 4, and will be managed by Mr. P. Fehy, now Manager of the company's Bournemouth office. The Poole office is conveniently situated near the railway station and opposite the Hants & Dorset Motor Services Limited bus depot in Kingsland Crescent.

British Buses for Madrid.—An order for single- and double-deck buses, valued at nearly £1,000,000, has been placed with Leyland Motors Limited by Empresa Municipal de Transportes de Madrid, the administration responsible for the city transport of Madrid. Representatives of the administration saw the double-deck bodywork being mounted on Leyland Titan chassis at the Elmdon works of Metropolitan-Cammell-Weymann recently. The order was secured in competition with 24 U.S.A. and Continental manufacturers.

Scottish Ski Trains.—British Railways, Scottish Region, are making arrangements for the 7.35 a.m. train from Glasgow Queen Street and the 7.40 a.m. train from Edinburgh Waverley to stop at Dalnaspidal on Sundays from January 27 to April 28, to afford a day's skiing. The special day return fare from either city will be 19s. The train from Glasgow will call at Stirling at 8.27 a.m. and at Perth both trains will be coupled to form a refreshment car train with stops at Pitlochry and Blair Atholl and arrival at Dalnaspidal of 11.36 a.m. The departure time of the refreshment car train on the return journey from Dalnaspidal will be 6.18 p.m. The arrangements have been made through the Scottish Council of Physical Recreation and the Scottish Ski Club, and the opening Sunday will be the occasion for a rally of members, who should apply to these authorities for instructions. A road service between Dalnaspidal Station and Drumochter Lodge will be provided, and a ski hire scheme is being arranged.

SEAG Sliding Roof Wagons.—A film depicting the use in service of SEAG sliding roof wagons was shown by the Stahlunion Co. Ltd., 61, Pall Mall, London, S.W.1, at the Park Lane Hotel, Piccadilly, London, W.1, on January 10. The wagon, which was designed and built by Siegener Eisenbahnbedarf A.G., Dreis-Tiefenbach, K.R. Siegen, Western Germany, in collaboration with the German Federal Railway, was depicted loading and unloading various products including rails, timber, and bulk materials through the sliding roof and also the end doors. It is stated that whereas with the normal wagon the loading of 15 tons of sheet iron occupied four men for four hr., the sliding roof wagon was loaded by two men in one hr.; some 3,000 of these wagons are now in service on the German Federal Railways, together with 750 on the French National Railways. Wagons of this type are also being constructed for other countries in Europe. The film was introduced by Mr. G. Pietsch, Export Manager. Visitors were afterwards entertained to luncheon at the Park Lane Hotel.

Forthcoming Meetings

Open currently and until further notice.—British Transport Commission: Historical Exhibition "Transport Treasures" in Shareholders' Meeting Room, Euston Station, from 10 a.m. to 6 p.m. on weekdays, and 2 to 6 p.m. on Sundays. Admission 6d.

January 25 (*Fri.*).—Institution of Railway Signal Engineers, Bristol Section, in the Meeting Room above Main Booking Hall, Temple Meads Station, at 5.30 p.m. Paper on "Automatic train control," by Mr. J. H. Currey.

January 26 (*Sat.*).—Permanent Way Institution. Conversazione at 222, Marylebone Road, London, N.W.1., at 5.30 for 6 p.m.

January 26 (*Sat.*).—Railway Correspondence & Travel Society, Sussex & Kent Branch, at the Railway Hotel, Brighton, at 7 p.m. Paper on "Control on the Southern Region," by Mr. B. J. Holden. Also film show.

January 26 (*Sat.*).—Stephenson Locomotive Society, Liverpool Centre, in the Conference Room, Central Station, at 7.30 p.m. Paper on "A signalman's viewpoint," by Mr. Norman Marlow.

January 29 (*Tue.*).—Railway Correspondence & Travel Society, Leeds & West Riding Branch, at the Talbot Hotel, Kirkgate, Bradford, 1, at 7.30 p.m. Paper on "Railway electrification," by Mr. G. W. Carter.

January 29 (*Tue.*).—Railway Correspondence & Travel Society, East Midlands Branch, at the H.C.S. Guild Room, Toll Street, Nottingham, at 7.30 p.m. Mr. J. F. Henton will present colour shots taken during 1956.

January 30 (*Wed.*).—Stephenson Locomotive Society, Midland Area, at the Birmingham Exhibition & Engineering Centre, at 7.15 p.m. Annual meeting and colour slide show: "A recent World tour," by Mr. J. C. Wilkins.

February 1 (*Fri.*).—Permanent Way Institution, Manchester & Liverpool Section, in the Everton Room, Exchange Hotel, Liverpool, at 7 p.m. Talk on "Relaying problems affecting signal engineers' and permanent way engineers' departments," by Mr. F. W. Young. Combined meeting with the Signal & Telegraph Society, Liverpool Branch.

February 1 (*Fri.*).—The Railway Club, at 57, Fetter Lane, London, E.C.4, at 7 p.m. Annual general meeting (members only), followed, if time permits, by a display of coloured transparencies by Mr. G. W. Powell.

February 2 (*Sat.*).—Railway Correspondence & Travel Society, South of England Branch, at the Y.M.C.A. Library, Friar Street, Reading, at 6.30 p.m. Paper on "Railway accidents," by Mr. L. B. Shepard.

February 4 (*Mon.*).—Historical Model Railway Society, at the headquarters of the Stephenson Locomotive Society, 32, Russell Road, London, W.14, at 7 p.m. Talk on "Leek & Manifold Valley Light Railway," by Dr. J. R. Hollick.

February 4 (*Mon.*).—The Society of Engineers, in the Apartments of the Geological Society, Burlington House, W.1, at 5.30 p.m. Inaugural meeting for the year 1957, and Presidential Address by Mr. E. C. Le Jeune.

February 5 (*Tue.*).—South Wales & Monmouthshire Railways & Docks Lecture & Debating Society, at the Angel Hotel, Westgate Street, Cardiff, at 6.30 p.m. Debate with British Railways, Bristol, Lecture & Debating Society.

February 5 (*Tue.*).—Institute of Transport, at the Connaught Rooms, Great Queen Street, London, W.C.2, at 12.30 for 1 p.m. Informal luncheon; principal guest Major-General Sir Reginald Kerr.

February 5 (*Tue.*).—Permanent Way Institution, Leeds & Bradford Section, in the British Railways Social & Recreation Club, Ellis Court, Leeds City North Station, at 7 p.m. Paper on "Mechanised relaying in a single-line tunnel," illustrated by lantern slides, by Mr. F. Everitt.

February 5 (*Tue.*).—Stephenson Locomotive Society, North Eastern Area, at the Conservative Association Rooms, 2, Jesmond Road, Newcastle-upon-Tyne, 2, at 7 p.m. Paper on "A museum for transport," illustrated by lantern slides, by Mr. J. H. Scholes.

February 5 (*Tue.*).—Institution of Mechanical Engineers, Applied Mechanics Group Discussion, at 1, Birdcage Walk, Westminster, London, S.W.1, at 6.45 p.m., on "Locking devices and the prevention of loosening of components."

February 6 (*Wed.*).—Electric Railway Society, at the Fred Tallant Hall, 153, Drummond Street, London, N.W.1, at 7.15 p.m. Paper by Mr. R. A. Nash on "Metropolitan Railway tickets."

February 7 (*Thu.*).—The Model Railway Club, at Caxton Hall, Westminster, S.W.1, at 7.45 p.m. Talk on "Railway Oddities," by Mr. G. Hatherill.

February 7 (*Thu.*).—Institution of Electrical Engineers, at Savoy Place, London, W.C.2, at 5.30 p.m. Sir Ifor Evans: Third Graham Clark Lecture on "The place of engineering in university education." Joint meeting with the Institutions of Civil and Mechanical Engineers.

February 7 (*Thu.*).—Institute of Traffic Administration, Portsmouth Centre, at the Chamber of Commerce, Portsmouth, at 7.30 p.m. Paper on "British Railways Modernisation," by Mr. D. Viney.

February 8 (*Fri.*).—Stephenson Locomotive Society, Scottish Area. at British Railways Offices, 302, Buchanan Street, Glasgow, at 7.30 p.m. Ten-minute papers by members.

February 8 (*Fri.*).—Institution of Mechanical Engineers. at 1, Birdcage Walk, Westminster, S.W.1, at 6 p.m. Paper on "The economics of plant replacement and renewals," by Mr. C. W. Griffiths.

February 11 (*Mon.*).—Institute of Transport, at the Jarvis Hall (R.I.B.A.), 66, Portland Place, London, W.1, at 5.45 p.m. Brancker Memorial Lecture.

OFFICIAL NOTICES

COMPANY SECRETARY required, with expert knowledge costing and estimating, by large railway engineering company, Lancashire. Apply in strictest confidence to Box No. 220, *The Railway Gazette*, 33, Tothill Street, London, S.W.1.

ASSISTANT CHIEF DRAUGHTSMAN required, with experience in design of Steam and/or Diesel Locomotives. The position is pensionable, there is a 5-day week, and canteen facilities are available. Write, giving details of experience, age, and salary required, to the Secretary, Andrew Barclay, Sons & Co. Ltd., Caledonia Works, Kilmarnock, Ayrshire.

WELL established manufacturers' Representatives situated in City of London desires further BRITISH REPRESENTATIVES to augment existing British and Continental connections. Clientele includes contractors, oil companies, consulting engineers, railway companies, home and overseas administrations, shipowners and merchant houses. Hand and machine tools, non-ferrous products, electrical products are especially interesting. Reply Box No. 227, *The Railway Gazette*, 33, Tothill Street, London, S.W.1.

POWER RECTIFIERS.—A large manufacturing firm in the Midlands requires an ENGINEER to assist in development and design of high power rectifier equipments. The department handles rectifiers of all modern types and for all kinds of applications, offering scope for exceptionally wide experience and interest, with good salary and prospects. Previous rectifier experience not necessary, but a Degree or approximate equivalent and some practical experience are desirable. Very good residential district, with excellent educational facilities of all kinds. Apply with full details to Box 233, *The Railway Gazette*, 33, Tothill Street, London, S.W.1.

MECHANICAL ENGINEER.—British Railways in Central Africa requires a DISTRICT MECHANICAL ENGINEER; age between 28-40; married man preferred. Preference given to man holding diploma of Inst.Mech.E. or Inst.Loc.E. Salary scale if qualified £1,240×£30—£1,300 per annum; £1,050×£30—£1,200×£40—£1,240 if unqualified; family allowance; unfurnished house rent free; contributory pension and medical aid schemes; six months' leave on full pay every 3/3½ years, with free passages. Write, giving details of age, marital status, qualifications, etc., to Box "E.A.," c/o J. W. Vickers & Co., Ltd., 7/8, Great Winchester Street, E.C.2.

GOLD COAST LOCAL CIVIL SERVICE.—ASSISTANT ENGINEERS, Gold Coast Railway. Duties: Responsibility for maintenance of track, bridges, buildings, and other engineering works on section of railway. Appointment on Contract/Gratuity terms. Gross emoluments in scale £1,130—£2,020 p.a. Gratuity payable on satisfactory completion of contract at the rate of £12 10s. for each month of service. £30—£60 outfit allowance. Free passages. Generous leave. Limited free medical attention. Low income tax. Candidates must have either: A University degree in civil engineering recognised by the Institution of Civil Engineers, and two years' subsequent approved general experience on civil engineering works; or passed Parts I and II Finals of the Institution of Civil Engineers' examinations or an exempting diploma, and had a total of five years' general experience on civil engineering works. Apply Director of Recruitment, Colonial Office, London, S.W.1. Give brief details of age, qualifications and experience. Quote BCD 110/13/019/D15.

THE NIGERIAN RAILWAY CORPORATION invites applications for the following posts, at the salary of £800 × £50 — £1,600 p.a. plus Overseas Pay of £300 p.a. All posts are pensionable or on contract terms with gratuity of 20% of total pay p.a.:

(*a*) ASSISTANT WORKS MANAGER (Loco). *Qualifications*: Candidates should have served an apprenticeship in a first-class Locomotive Workshop with at least two years' subsequent experience in the organisation and administration of Railway Locomotive Workshops. They must have had Drawing Office experience and knowledge of production methods. Carriage and Wagon Building and Maintenance experience is desirable, but not essential. Candidates must possess the A.M.I.Mech.E. or have passed parts A and B. Age—26 to 45 years. For contract appointments, the professional qualifications may be waived, if compensated by wide experience, and the age limit extended to 55 years.

(*b*) ASSISTANT WORKS MANAGER (Carriage and Wagon). *Qualifications*: Candidates should have served a regular apprenticeship on a British Railway or in the Carriage and Wagon Workshop of a rolling stock manufacturer, with subsequent experience on a railway. They must have Drawing Office experience and should possess the A.M.I.Mech.E. or have passed parts A and B. It is desirable that the candidates should have had some experience of Workshop organisation, including progress and production methods. Age—25 to 45 years.

(*c*) CHIEF MECHANICAL DRAUGHTSMAN. *Qualifications*: Candidates should have served an apprenticeship on a first-class railway or with a reputable firm of Locomotive Builders, followed by at least three years in a Locomotive Drawing Office. Candidates must possess the A.M.I.Mech.E. or have passed parts A and B.

Commencing salary depends upon qualifications and experience. Terms of service provide for tours of fifteen months each, with seven days paid leave per month of service, free passage for the officer and wife and separate domicile allowance of £75 per annum each in respect of a maximum of two children, whilst in U.K. or cost of their passages to and from Nigeria, if under 18 years of age, part furnished quarters at low rental, outfit allowance of £60, payable on first appointment. Applications to THE LONDON REPRESENTATIVE, Nigerian Railway Corporation, 11, Manchester Square, London, W.1.

REQUIREMENT of Rolling Stock against Global Procurement Programme GP-11 1957-58. The Railway Board, Government of India, propose to obtain from established and reliable manufacturers ROLLING STOCK and other equipment shown in the list below. Manufacturers in Europe, United Kingdom and North America can obtain copies of the Rolling Stock Programme No. GP-II 1957/58 giving particulars of items required and explaining the procedure for submission of quotations from the Director General, India Store Department, Government Building, Bromyard Avenue, Acton, London, W.3, at a cost of 3s. per copy, quoting reference S 2200/56 CDN. Manufacturers in other countries and authorized agents in India of all Foreign manufacturers can obtain such copies from The Chief Design Engineer, Central Standards Office, Baroda House annexe, New Delhi, at a cost of rupees two per copy.

List of Rolling Stock & Railway Equipment.

(1) LOCOMOTIVES:

2 Nos. NG Steam locos. 2-8-4 type. Spec. L 198/56.
6 Nos. NG Steam locos. 2-8-2 type. Spec. L 199/56.

(2) BOILERS:

2 Nos. BG Loco-boilers suitable for I.R.S. 'XB' class locos. Spec. L 202/56.
10 Nos. MG Loco-boilers suitable for I.R.S. 'YB' class locos. Spec. L 246/56.
30 Nos. MG Loco-boilers suitable for I.R.S. 'YG & YP' class locos. Spec. L 251/56.
12 Nos. 'MG' Loco-boilers suitable for I.R.S. 'YL' class locos. Spec. L 253/56.
12 Nos. 'MG' Loco-boilers suitable for I.R.S. 'YC' class locos. Spec. L 247/56.
2 Nos. N.G. Loco-boilers suitable for I.R.S. 'ZB' class locos. Spec. L 281/56.
4 Nos. NG Loco-boilers suitable for 2-8-2 type 'NH/3' class locos. C-R-S/1956.

(3) FIREBOXES:

73 Nos. BG steel fireboxes for A/CWD boilers. Spec. L 7/54 with Corr. No. 1.
41 Nos. MG steel fireboxes for MAWD boilers. Spec. L 8/54 with Corr. No. 1.

(4) RAIL CARS:

12 Nos. B.G. All metal light-weight rail cars third class. Spec. 56-B-29.
12 Nos. M.G. All metal light-weight rail cars third class. Spec. 56-M-30.

(5) CRANES:

27 Nos. B.G. Steam/Diesel operated self-propelling transportation travelling cranes. Spec. CR 5/54 with Corr. sheet.
4 Nos. MG 5 Steam/Diesel operated travelling cranes. Spec. CR 6/54.
1 No. NG Steam/Diesel operated self-propelling transportation travelling crane general purpose. Spec. CR 2/55.

BOUND VOLUMES.—We can arrange for readers' copies to be bound in full cloth at a charge of 25s. per volume, post free. Send your copies to the SUBSCRIPTION DEPARTMENT, Tothill Press, Limited, 33, Tothill Street, London, S.W.1.

Railway Stock Market

The advance in stock markets in the confident expectation of a reduction in the bank rate was accelerated earlier in the week when the view appeared to gain ground that in the near future a bigger cut than ½ per cent in the bank rate is possible. British Funds responded to this view with War Loan 3½ per cent rising to £74½. Moreover, industrial shares recorded a further widespread rise. Business broadened to many shares which had not previously participated to any extent in the market rise and which appear to have reasonable prospects of maintaining dividends at last year's levels. The buoyant trend is, of course, due in part to more general confidence in the outlook because it is believed the Macmillan Government will bring a new approach to pressing problems. If the buoyant trend continues in stock markets it can be expected that many more new issues will make their appearance following the outstanding success achieved by those recently made. Imperial Chemical 5½ per cent loan stock, which is now £20 paid, has been up to a premium of as much as £8½. There are indications of a large amount of money seeking investment.

Business in foreign railway stocks was again on a small scale, but a number of features developed. Costa Rica ordinary stock was strong with an advance on the week from 23 to 28. The first debentures have changed hands at 76. In other directions, Chilean Northern 5 per cent first debentures marked 46, and elsewhere, business up to 50 was recorded in Dorada ordinary stock. Guayaquil & Quito 5 per cent bonds were again quoted at 92. International of Central America no par value shares kept at $34½ and the gold bonds at £175½. Nitrate Rails shares at 20s. and Taltal Railway shares at 12s. were at the same levels as a week ago.

There was rather more business in United of Havana stocks on the break-up estimates, and the second income stock has strengthened from 7⅛ to 7⅞. The consolidated stock was 2¼.

Antofagasta ordinary stock, though rather more active, did not keep best levels, and at 31 compared with 32 a week ago, but the preference stock moved fractionally higher at 45½.

The set-back in Wall Street markets earlier in the week affected a number of shares, notably Canadian Pacifics, which at $61¼ compared with $65¼ a week ago, but on the other hand, the company's sterling stocks strengthened, the 4 per cent preference from £57½ to £61 and the 4 per cent debentures from £67½ to £70½. Rise in the latter was in sympathy with the rise in British Funds which influences sterling securities generally. In other directions, White Pass shares have gone back from $20½ to $18¾; Peru Transport shares firmed up to slightly over $1½.

In other directions, Nyasaland Railways shares strengthened and recorded business ranging from 9s. 9d. to 10s. 4½d. Midland of Western Australia stock remained at 8½.

Among Indian stocks, Barsi marked 61 and West of India Portuguese stock changed hands at up to 53.

Beyer Peacock at 35s. gained 1s. and there was a better trend in locomotive and engineering shares generally. Charles Roberts 5s. shares firmed up from 11s. 6d. to 11s. 9d. and in response to the full report Westinghouse Brake were good, rising to 76s. compared with 75s. a week ago. Birmingham Carriage at 15s. 3d. did not hold all their recent improvement, however, and North British Locomotive eased from 11s. to 10s. 9d., but Hurst Nelson kept at 37s. Elsewhere, Wagon Repairs 5s. shares were good at 13s. 3d. compared with 11s. 3d. a week ago. Gloucester Wagon 10s. shares have strengthened from 11s. 10½d. to 12s. 3d. G. D. Peters kept at 23s. 9d.

Steel shares have rallied with United Steel 32s. 9d. compared with 31s. 6d. a week ago, and the new shares at a premium of 3s. Sentiment has been helped by the belief that the next general election is a long way ahead. It is being assumed that there will be a number of issues by steel companies on the lines adopted by United Steel, namely a rights offer to shareholders. Stewarts and Lloyds have moved up from 57s. 3d. to 58s. 3d. Elsewhere, shares of companies connected with atomic energy developments were a strong feature on the big plans to be announced which will keep Britain in the lead in this field. Compared with a week ago, Associated Electrical Industries shares have risen further from 67s. 3d. to 72s. 3d., General Electric from 54s. 3d. to 57s., and English Electric from 48s. to 54s. Babcock & Wilcox also advanced further (from 72s. 3d. to 80s.) and T. W. Ward gained 1s. at 66s. 6d.